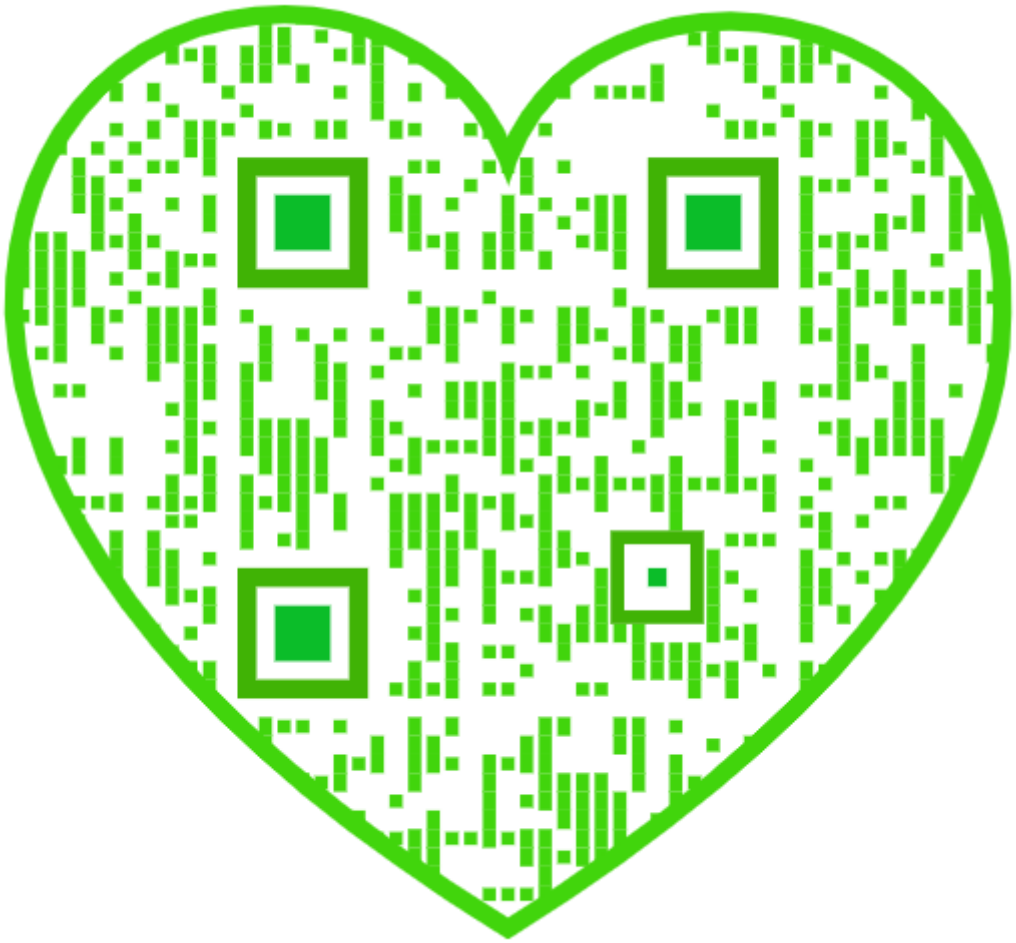

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A MANUAL

of

OBSTETRICS

BY

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WITH 216 ILLUSTRATIONS

PHILADELPHIA AND LONDON

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TO THE CLASSES OF THE MEDICAL SCHOOL OF
THE UNIVERSITY OF PENNSYLVANIA, PAST
PRESENT AND FUTURE, THIS BOOK
IS DEDICATED BY THEIR
FELLOW-STUDENT,

THE AUTHOR.

PREFACE

This book is written as a companion to the author's Manual of Gynecology. It also presents, as far as possible on the printed page, the methods of teaching the subject he has used with satisfaction for the last twenty years. Throughout the book an effort has been made to present the subject clearly and concisely, and to avoid all unprofitable discussion. The methods of treatment and technic of operations advocated have all been tested in practice and have given satisfactory results.

The scope of the book has been rather sharply limited. A minimum of embryology has been included. Diseases of the newborn child are included only in so far as they occur during the puerperium. The chapters on lacerations of the birth-canal and consequences of childbirth, while differing somewhat in scope, are necessarily very similar to the same chapters in the Manual of Gynecology.

A new classification of deformities of the pelvis is presented, classifying them according to their most prominent deformity. This method has been found easier for the student to remember, and simplifies the discussion of their management.

Especial care has been given to the description of the mechanism of labor, with a view to simplifying this, to the student, most puzzling subject. The illustrations in this chapter have been chosen with the idea of enabling him to visualize the different presentations, a thing most essential in the proper application of forceps.

The longest chapter is that on the obstetric operations. Especial care has been given to a somewhat extensive descrip-

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tion of that most dangerous of all obstetric instruments, the forceps. The different operations are all detailed, with indications, contra-indications and the steps of their performance.

The entire subject of obstetric hemorrhage is to be found in one chapter, with precise directions as to management.

This book, like the Manual of Gynecology, is presented with the hope that it will be found useful by both medical student and practitioner, whose time for voluminous reading is limited.

JOHN COOKE HIRST.

1823 PINE STREET,
PHILADELPHIA, PA.,
October, 1919.

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A MANUAL OF OBSTETRICS

CHAPTER I

ANATOMY OF THE PELVIS AND GENERATIVE ORGANS. CONGENITAL ANOMALIES OF THE UTERUS

THE PELVIS

The pelvis is the bony ring through which the weight of the body is transmitted to the lower extremities. It is composed of four bones—the two innominate bones, the sacrum and the coccyx. The two innominate bones are joined to the sacrum posteriorly, and at the symphysis pubis anteriorly. The joints are very strong, but the sacro-iliac joints possess a certain degree of motion, which is of importance in labor. The anatomy of the pelvis need be considered here from the obstetric point of view only. The female pelvis differs markedly from the male, being of importance in childbearing. It is of greater breadth, of less depth, the pelvic inlet is larger, and the pelvic arch much wider and lower.

The pelvis is divided into two portions called the *false* and the *true* pelvis.

The false pelvis is that portion lying above the promontory of the sacrum, the top of the symphysis and the ileopectineal line. It is bounded by the lumbar vertebræ, the iliac fossæ, and the lower portion of the anterior abdominal wall. It is of little importance from an obstetric standpoint.

The true pelvis is that portion of the pelvis lying below the ileopectineal line, or the *linea terminalis*, as it is called by some authors. It is the portion directly concerned in childbearing. Its cavity may be described as an obliquely trun-

cated, slightly curved cylinder. This description is not strictly accurate, as the pelvic canal is of different shapes at different levels, and it should be studied at typical points, to gain a correct idea of its size and shape.

Pelvic Planes, Their Shapes and Measurements

The planes at which the pelvis is studied ordinarily are four in number:

Fig. 1.—Showing the antero-posterior, transverse and oblique diameters of the pelvic inlet. (*B. C. Hirst.*)

(1) The *plane of the inlet*, or *superior strait;*
(2) The *plane of greatest expansion*, or *pelvic expansion;*
(3) The *plane of greatest contraction*, or *pelvic contraction*, and
(4) The *plane of the outlet*, or *inferior strait.*

The plane of the inlet or superior strait is bounded by the promontory of the sacrum, the ileopectineal line, and the top of the symphysis pubis. Its *shape* is cordiform, the promon-

tory jutting forward, forming two bays on either side for the reception of the large vessels and nerves, where they are guarded from injury during labor. Its *measurements* are: a *transverse* diameter 13.5 cm., measured at right angles to the conjugate, representing the greatest width; *two oblique* diameters of 12.75 cm. each, measured from one sacro-iliac junction to the ileopectineal eminence on the opposite side; and an *anteroposterior* diameter, the so-called true conjugate, of 11 cm., measured from the promontory of the sacrum to the middle of the internal surface of the symphysis ⅛ inch below its upper edge.

The plane of the greatest expansion is bounded by a line passing through the middle of the symphysis, the tops of the acetabula and between the second and third pieces of the sacrum. Its *shape* is almost circular, its anteroposterior diameter being slightly longer. Its *measurements* are: an *anteroposterior* diameter of 12.75 cm. and a *transverse* diameter of 12.50 cm. both representing the longest distance in either direction. On account of the sacrosciatic notches, it is not possible to take an oblique diameter.

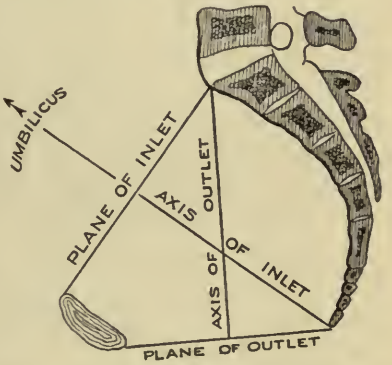


FIG. 2.—The planes of the inlet and outlet, with the axes of the pelvis.

The plane of the greatest contraction is bounded by a line passing through the bottom of the symphysis, the spines of the ischium, and the third and fourth pieces of the sacrum. Its *shape* is *elliptical*, being 1 cm. longer anteroposteriorly than laterally, and its measurements are: an *anteroposterior* diameter of 11.50 cm., and a *transverse* diameter of 10.50 cm.

The plane of the outlet, or inferior strait, is bounded by a line drawn through the tip of the coccyx, the tuberosities of

the ischia and the lower margin of the pubic arch. Its *shape* is *cordiform*, due to the projection forward of the tip of the coccyx. Its *measurements* are: a *transverse diameter* of 11 cm. and an *anteroposterior diameter* of 9.5 cm. This last is not a constant figure, as in labor the coccyx normally swings back as the child's head passes over it, making the actual anteroposterior diameter extend from the tip of the sacrum, a distance of 11 cm.

Pelvic direction means the direction or course of the pelvic canal. This can be expressed by a line drawn parallel to the curve of the sacrum, and equidistant at all points from the pelvic walls. This definition is not mathematically accurate, but is approximately so. The old formula expressing the direction of the pelvic canal, known as the "curve of Carus," is very complicated and also inaccurate.

Pelvic Inclination.—By this term is understood the angle which the planes of the superior and inferior straits form with the horizon. In the normal pelvis, with the woman in the erect posture, the promontory of the sacrum is about 10 cm. higher than the upper edge of the symphysis. The normal inclination can be approximated by holding a pelvis in such a way that the anterior superior spines of the ilium and the spines of the ischium are in the same vertical plane. The inclination of the inlet is ordinarily 55 degrees, and that of the outlet 10 degrees.

The conjugato-symphyseal angle is the angle formed by the axis of the symphysis and the line representing the true conjugate. It is normally 105 degrees.

The pelvic ligaments are not of great interest, except the obturator membranes and the sacrosciatic ligaments. The obturator membranes close the obturator foramina, and the sacrosciatic ligaments, closing the large sacrosciatic notches posteriorly, receive pressure from the long diameters of the child's head in labor, and assist in directing the presenting part forward under the symphysis.

Pelvic Muscles.—The pelvic cavity is greatly encroached upon by the iliopsoas, obturator internus and pyriformis muscles. They act as cushions during labor, being gradually flattened out and thus protecting the child from injury. The transverse diameter of the pelvis, with the muscles *in situ*, is 8 cm., instead of 13.5 in the dried specimen.

Pelvic floor is composed chiefly of the levator ani, the transversus perinei, superficial and deep, the bulbocavernosus, the anterior and posterior triangular ligaments, the coccygeus and the sphincter ani muscles. The levator ani is far the most important. It consists of two halves, passing back from the anterior pelvic wall and encircling the vagina and rectum. It is a muscular band as broad as the first two joints of the index-finger, and is the chief support of the rectum and posterior vaginal wall.

The deep transversus perinei muscle is that portion of the levator ani which has a separate sheath and is inserted in the perineal body in the middle line. It lies between the superficial and deep perineal fascias, or triangular ligament. The anterior triangular ligament is an extension of Colles' fascia. The bulbocavernosus lies in the labium majus, keeps the labia in apposition, and prevents gaping of the vulva.

DEVELOPMENT OF THE FEMALE SEXUAL ORGANS

The development of the genito-urinary system up to a certain point follows the same course in both sexes. It is developed from the Wolffian body, the Wolffian duct and the Müllerian ducts. In the female the Wolffian duct atrophies and the Müllerian ducts form uterus, tubes and vagina, the ovary being developed from the Wolffian body. The remains of the Wolffian duct are found in the ducts of Gärtner, in the anterior vaginal wall. The anterior portions of the Müllerian ducts coalesce to form the tubes and the upper portion of the uterine body. The posterior portions of the ducts unite to form the lower part of the uterine body, the cervix and the vagina.

The female genitalia are divided into (1) external and (2) internal organs. The external organs are: (1) Mons veneris, (2) the labia majora and minora, (3) the clitoris, (4) hymen, (5) the vagina, which may be properly included under this head. The internal organs are (1) the uterus, (2) the Fallopian tubes, (3) the ovaries. The following is a brief description of these organs.

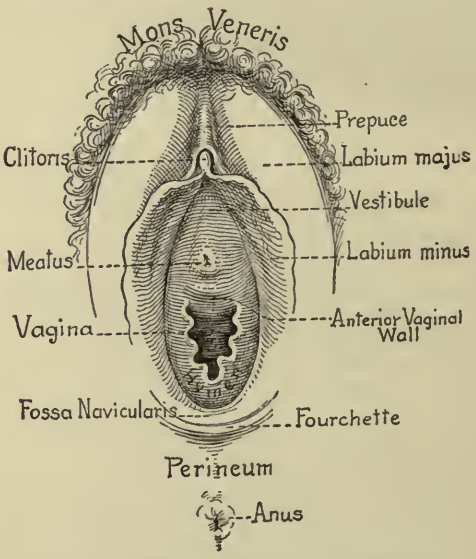


FIG. 3.—Diagram of the external genitalia.

The mons veneris is the name given to the fatty cushion resting upon the anterior surface of the symphysis, covered, in the adult, with a more or less profuse growth of hair. In the female the area covered by the hair is triangular, its base corresponding to the upper edge of the symphysis.

The vulva is the name given to the structures lying beneath the mons veneris. Its direction is usually horizontal, when the woman is erect. It varies greatly in appearance, depending particularly upon whether or not the woman has borne children.

The labia majora are two elongated, rounded masses of fatty tissue covered by skin extending down on either side of the vulva. They are usually 7 to 8 cm. in length, 2 to 3 cm. wide and 1 to 1.5 cm. thick, becoming narrower and thinner at their lower extremities. They vary in appearance, depending upon the amount of subcutaneous fat. In virgins and nulliparous women they are in close approximation, while in women who have borne children, they frequently gape widely. They are analogous to the scrotum in the male.

The labia minora are two narrow, triangular folds of tissue, seen between the upper part of the labia majora, when these are separated. They converge anteriorly, surrounding the clitoris, while posteriorly they merge gradually into the labia majora.

The clitoris is analogous to the penis in the male, but differs in having no corpus spongiosum and no urethra. It consists of a glans, a corpus and two crura, and is rarely more than 2 cm. long. Its glans is enclosed by the upper portion of the two labia minora.

The vestibule is the almond-shaped area extending from the clitoris to the fourchet, bounded laterally by the labia minora. The portion between the fourchet and the vaginal opening is called the fossa navicularis, and is usually obliterated by childbirth.

The vulvovaginal glands, or **Bartholin's glands** are two compound racemose glands, about the size of a small bean. They are situated under the constrictor vaginæ, behind the lower portion of the labia majora. Their ducts, 2 cm. long, open on the sides of the vestibule, just outside of the vaginal opening. They are a frequent lurking place of gonorrhea. They are sometimes called the glands of Duverney, who first described them in the cow.

The hymen is the membranous structure which more or less completely occludes the vaginal opening. It presents marked differences of shape and thickness. The most common shape of the hymeneal opening is crescentic or circular. The most important of the other forms are the septate, the

cribriform and the fimbriated hymen. It is usually ruptured at the first coitus, the ruptures being multiple and most often in the posterior portion. It is usually destroyed by childbirth, the atrophied remains being known as *myrtiform caruncles*. Very rarely it is imperforate. It may also persist unruptured after coitus or even childbirth.

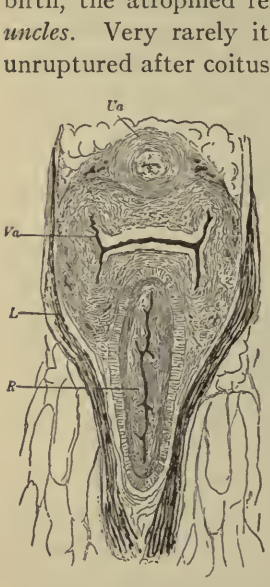


FIG. 4.—Section illustrating the characteristic form of the vaginal cleft: *Ua*, Urethra; *Va*, vagina; *L*, levator ani; *R*, rectum. (*Henle.*)

The vagina is a musculomembranous canal extending from the vulva to the uterus. It runs through the pelvic floor, and its walls are normally in close apposition. A cross-section of the vagina resembles the letter H. The vagina is about 8 cm. long anteriorly and 10 cm. long posteriorly. The shape of the anterior and posterior walls is triangular, the canal being broadest near the cervix. A prominent longitudinal ridge projects from both the anterior and posterior walls, known as the anterior and posterior vaginal columns. From this ridge, in women who have not borne children, extend numerous transverse folds, known as rugæ. These disappear after repeated childbirth, and the vaginal walls are then frequently smooth. The vagina is lined by a mucosa composed of numerous layers of stratified squamous epithelium. The vaginal mucosa contains no glands. In the embryo the vagina is composed of a solid mass of polygonal cells. The vaginal lumen is formed about the third month of fetal life, by the degeneration of these cells.

THE UTERUS

The uterus is a hollow muscular organ, partially covered with peritoneum. It lies in the pelvis, between the bladder

and the rectum. Its axis is approximately at right angles to the vagina. It is pear-shaped, slightly flattened antero-posteriorly, and consists of a body and a neck or cervix. The uterus, in the adult female is about two and one-half inches long and weighs about two ounces. The uterus is composed of an inner epithelial layer, a middle muscular layer and, in its upper two-thirds an outer or peritoneal layer. The inner layer, which lines the cavity, is called the endometrium. It

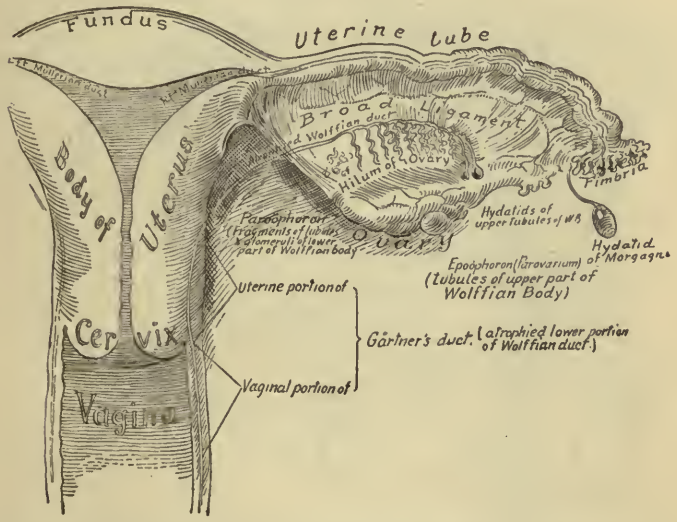


FIG. 5.—Diagram of the uterus and vagina, and the structures of the broad ligament. (*Kelly after Cullen.*)

is a thin velvety membrane, 1 to 2 mm. in thickness, composed of a surface epithelium, a stroma of short spindle-cells, and small tubular glands, lined by columnar epithelium. The surface epithelium is a single layer of ciliated columnar epithelial cells. The stroma contains numerous blood and lymph channels. In the cervix are seen numerous ridges of mucous membrane, radiating from a central ridge, the figure being known as the *arbor vitæ* or *plicæ palmatæ*.

The uterine muscle, or the myometrium, is composed of

bundles of non-striated muscle fibers, united by connective tissue containing many elastic fibers. The arrangement of these bundles is still a matter of dispute. The uterine blood-vessels are very numerous, and pierce the uterine wall in all directions.

The ligaments of the uterus are ten in number, viz.: 2 broad, 2 round, 2 uterosacral, 2 uterovesical and 2 cardinal.

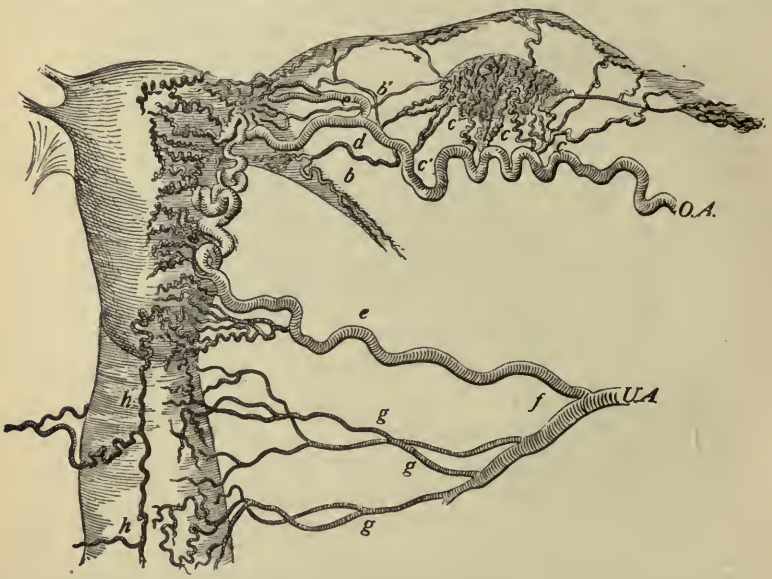


FIG. 6.—The arteries of the uterus and ovaries: *O, A.*, ovarian artery; *b*, artery of the round ligament; *b'*, branch to the tube; *c, c, c*, branches to the ovary; *d*, continuation of main trunk; *e*, branch to the cornu; *U.A.*, uterine artery; *e*, main trunk; *f*, bifurcation; *g*, vaginal branches; *h*, vaginal branch from the cervical artery. (*Hyrtl.*)

In the bases of the broad ligaments are two bands of dense connective tissue which are regarded as ligaments of the uterus—the cardinal ligaments. They are attached to the supravaginal portion of the cervix. The uterine ligaments are partly suspensory and partly act as guy ropes.

The blood-vessels of the uterus are the uterine and ovarian arteries, which anastomose and send numerous branches to

the uterus. There is quite free communication between the vessels on the two sides of the uterus. The *veins* form a large plexus around each uterine artery, form the uterine veins and empty into the hypogastric. The return blood from the ovary and upper part of the broad ligament is collected by veins which form a large plexus—the *pampiniform plexus*. The vessels from this form the ovarian veins and the ovarian veins empty, the *left* into the renal, the *right* into the vena cava.

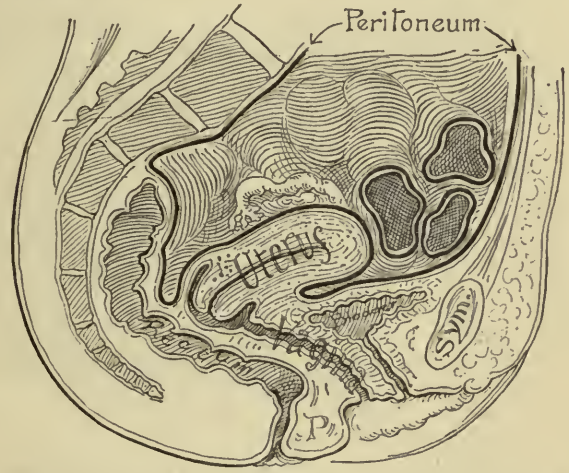


FIG. 7.—Heavy black lines indicate reflection of peritoneum. Note the difference in the anterior and posterior uterine reduplication.

The Lymphatics of the Uterus.—The lymphatics of the uterus terminate in different glands. Those from the cervix empty into the hypogastric glands; those from the uterus into the deep lumbar glands, situated in front of the aorta, about the level of the kidney.

The nerves of the uterus are derived partly from the third and fourth sacral nerves, but chiefly from the sympathetic system.

THE FALLOPIAN TUBES

The Fallopian tubes are two convoluted muscular canals extending from the uterine cornua through the upper portion

of the broad ligaments. They are 12 to 14 cm. long, the left being slightly the longer. They are divided into the *uterine* portion, extending from the cornu to the upper angle of the uterine cavity; the *isthmus*, the narrow portion of the tube adjoining the uterus; the *ampulla*, or wider portion of the tube, and the *fimbriated extremity* or abdominal opening. These fimbriæ are exuberant folds of the lining mucous membrane, and one of them—the ovarian fimbria—extends nearly or quite to the ovary.

The tube is composed of an inner mucous, a middle muscular and an outer peritoneal layer. The lining mucous membrane is composed of a single layer of high columnar ciliated cells,

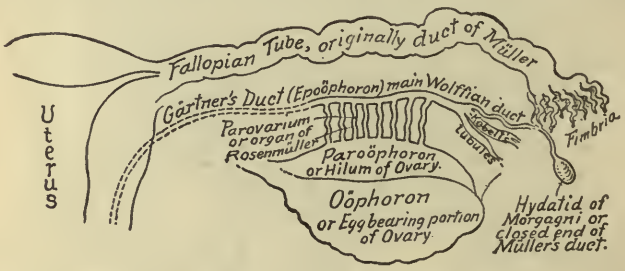

Fallopian Tube, originally duct of Müller
Uterus
Gärtner's Duct (Epoöphoron) main Wolffian duct
Parovarium or organ of Rosenmüller
Paroöphoron or Hilum of Ovary.
Tubules
Fimbria
Oöphoron or Egg bearing portion of Ovary
Hydatid of Morgagni or closed end of Müllers duct.

FIG. 8.—Diagram of the tube, ovary and broad ligament, and their structure. (*After Stewart.*)

resting upon a thin basement membrane. There is no submucosa. The mucosa is arranged in folds which vary from a comparatively simple arrangement near the uterus to an extraordinarily complex one near the abdominal end. The cilia lash toward the uterine cavity.

The muscular coat is composed of two layers of non-striated muscle, an inner circular and an outer longitudinal one. Some of the inner fibers run longitudinally also.

The caliber of the tube varies from the uterine end, which will admit a bristle, to the ampulla which admits a fine probe.

THE OVARIES

The ovaries are two almond-shaped organs, slightly flattened, lying against a small depression in the posterior sur-

face of the broad ligament, and attached to the ligament by the *mesovarium*. The ovary is of a mother-of-pearl color, 5 cm. long, 3 cm. broad and 1.5 cm. thick, weighing about 8 grams. The *hilum* of the ovary is that portion of the margin to which is attached the mesovarium.

The external appearance of the ovary varies with the age of the woman. In young women its surface resembles mother-of-pearl, through which show a number of small vesicles—the graafian follicles. In older women the ovary is rough and corrugated, and it atrophies rapidly after the menopause. The ovary is divided into the *medulla* or central portion, which contains the blood-vessels, and the *cortex*, which contains the mature and immature follicles.

An ordinary graafian follicle is simply a connective-tissue space in the cortex, containing a highly specialized cell—the ovum—and surrounded by a wreath of capillary blood-vessels.

A mature graafian follicle consists of a connective-tissue covering—the *theca folliculi;* an epithelial lining—the membrana granulosa; the liquor folliculi and the ovum. The ripening of the graafian follicle will be discussed in the next chapter.

The Corpus Luteum.—The ripe follicle ruptures through the *stigma*, which is a necrotic spot in the follicular wall, at its most prominent part, usually opposite the ovum. The ovum, the discus proligerus (the heaped-up portion of the membrana granulosa, in which the ovum is embedded) and the liquor folliculi are discharged. The walls of the follicle collapse into folds, like a fan, and the point of rupture heals rapidly. The cavity, due to the activity of the lutein cells or fibroblasts, is filled in with connective tissue rich in blood-vessels. This structure is known as the corpus luteum. The connective tissue is gradually absorbed, till about a month after the rupture of the follicle nothing is left but a small scar on the surface of the ovary. The corpus luteum of pregnancy is simply an exaggeration of the corpus luteum of menstruation. It is much larger, occupying sometimes one-third of

the ovary, and lasts to some extent throughout the entire pregnancy, being largest at the third month.

The blood-supply of the ovary is derived chiefly from the ovarian artery.

THE CONGENITAL ANOMALIES OF THE UTERUS

The uterus, as has been said, develops from the perfect fusion of the two Müllerian ducts. Sometimes these ducts fail to unite, and from this failure result the various forms of congenital deformities of the uterus. They vary from almost complete absence of the uterus to the actual duplication of the uterus and vagina.

The various deformities are:

1. **Uterus didelphys,** or duplex, resulting from a complete failure of fusion, and usually accompanied by double vagina.

2. **Uterus unicornis,** due to the development of one Müllerian duct and the atrophy of the other.

3. **Uterus bicornis unicollis,** a uterus with one cervix and two bodies, each with one tube and ovary.

4. **Uterus cordiformis,** presenting the conventional heart-shape.

5. **Uterus incudiformis,** or **anvil-shaped uterus.**

6. **Uterus septus, subseptus** or **biforis;** various deformities of the uterine cavity, due to junction of the ducts but imperfect union of the canals.

Effect upon Pregnancy.—1. May proceed normally to term.

2. Frequently simulates extra-uterine pregnancy, if in rudimentary horn of a double uterus or in a uterus unicornis.

3. Abortion, due to failure of the uterus to enlarge.

4. Rupture of uterus.

The three latter are the chief dangers of pregnancy in congenital deformities. The pregnancy may go on to term, which is the rule in the minor grades of deformity.

Effect upon Labor.—The deformity most likely to cause trouble in labor is the double uterus, and the following are the chief dangers:

1. Obstruction to labor by the non-pregnant half.
2. Rupture of the uterus.
3. Inertia uteri.
4. Postpartum hemorrhage.
5. Putrefaction of decidua in the non-pregnant half, and consequent septic infection.

Diagnosis can usually be made by careful bimanual examination, under an anesthetic if necessary, but many cases are overlooked, as spontaneous labor occurs in the majority of cases.

Treatment is inaction, unless the symptoms simulate extra-uterine pregnancy. This is not likely except in uterus unicornis or pregnancy in a rudimentary horn of a double uterus. In such a case the treatment is the same as for extra-uterine pregnancy—immediate laparotomy and removal of the gestation sac.

CHAPTER II

MENSTRUATION. OVULATION. STERILITY. DEVELOPMENT OF THE FETAL APPENDAGES. FETAL CHARACTERISTICS

MENSTRUATION

Menstruation is the name given to the periodic bloody discharge from the genitalia of women, occurring on an average of once in 28 days, during the period of their sexual activity; from about the fifteenth to the forty-fifth year.

Cause.—The cause of menstruation is most obscure, depending upon some nervous influence from the sympathetic nervous system, which causes a periodic congestion of the genital organs.

Mechanism.—The anatomic changes in the genital organs during menstruation are well understood. The endometrium, about five days before the period, begins to swell, until at the time of the discharge, it is about 8 mm. thick, brownish-red and very soft. It is filled with delicate new-formed capillaries. The bleeding occurs mainly by a diapedesis through the walls of these capillaries, and the escape of the blood between the cells of the surface epithelium, with very little or no destruction of tissue. The surface epithelium is not as a rule thrown off. The regeneration of the endometrium after the period takes about seven days. The so-called *menstrual cycle* of the endometrium is five days' preliminary swelling, four days of the period, seven days' regeneration and twelve days of quiescence.

Time of Appearance and Cessation.—In this climate menstruation appears usually at the age of 14 to 15 years. The time of appearance is influenced by climate, mode of life, etc. The warmer the climate, the earlier the onset of menstruation.

It is not infrequent to observe a bloody discharge, simulating menstruation, from the genitalia of female infants. Precocious menstruation in very young children is not very uncommon, and is usually associated with precocious sexual development.

Cessation or the Menopause.—The menses cease ordinarily about the forty-fifth year. Exceptions to this rule are frequent They sometimes cease as early as the twenty-fifth year, and persist sometimes well into the fifties, and, rarely, even later.

The interval between periods is usually 28 days. This varies greatly, and wide variations from the rule are not inconsistent with good health.

The menstrual molimina is the name given to the local and reflex symptoms during menstruation—enlargement of the breasts, pain in breasts, headache, dizziness, backache, etc.

The duration of the flow is normally three to five days. This again varies widely, many women menstruating for only two days and others for seven or more, and remaining perfectly healthy.

The Character of the Flow.—The menstrual discharge comes mainly from the uterine mucous membrane and in slight part from the tubes. It is composed of blood, mucus, and epithelial cells. It is dark in color, alkaline, has a distinct odor, like marigold, due to the secretions of the sebaceous glands at the vaginal outlet, and should not clot.

The amount of the flow has been estimated at from 4 to 6 ounces. Practically it is measured by the number of napkins needed for adequate protection. If more than three a day are required, during the height of the flow, the quantity is excessive.

OVULATION

Ovulation means the rupture of the ripe graafian follicle and the extrusion of the ovum. As the follicle ripens it retreats deeper into the ovary, along the line of least resistance. During the period of menstrual congestion, the follicle rapidly secretes liquor folliculi and projects like a blister from the surface of the ovary. It ruptures through the *stigma*, a

necrotic spot in the follicle wall, usually opposite the ovum, and the ovum, discus proligerus, and liquor folliculi are extruded.

The Connection between Menstruation and Ovulation.—In the majority of women menstruation and ovulation are practically synchronous. They are not necessarily so, however, and either can occur independently of the other.

The maturation of the ovum, or ripening, is the name given to the change in the ovum, more especially in the nucleus, by which it is prepared for fertilization. Only a brief outline can be given here. The changes are supposed to begin shortly before the follicle ruptures and to be completed during the journey of the ovum through the tube.

The germinal vesicle gradually approaches the surface of the ovum, loses its membrane, and is, in a short time, transformed into a typical karyokinetic figure.

This figure by the usual changes, becomes spindle-shaped, and lies perpendicular to the surface of the ovum. The chromatin of the spindle is arranged in two star-shaped figures (the amphiaster stage) and extrudes portions of its substance in the form of small globules—the polar globules—usually two in number. These globules are cast off and disappear; the nucleus retreats into the interior of the ovum, and becomes the female pronucleus. The cause of these changes is not known. Their failure to occur is one of the accepted theories of the origin of dermoid cysts, it being supposed that the polar globules may unite with the female pronucleus and allow an imperfect degree of fetal development.

The migration of the ovum is the method by which the ovum gains access to the tube and then to the uterine cavity. The cilia of the cells upon the fimbriated extremity of the tube lash toward the lumen of the tube, and cause a slight current in the thin layer of fluid lying between the pelvic organs. The ovum, when discharged, is taken up by this current, and wafted into the tube, and along the tube to the uterine cavity. The ovum is usually carried in to the tube corresponding to the

ovary from which it was discharged, but it may be carried into the opposite tube. (External transmigration of the ovum.)

The seminal fluid containing the spermatozoa, is deposited during coitus in the vagina, in the so-called *seminal lake* behind and below the cervix. The seminal fluid is a yellowish-white, thick fluid, derived from the testicles, prostate and Cowper's glands. The *quantity* at each ejaculation is one to two drams. It contains water, phosphates, fats, spermatin and spermatozoa. The number of spermatozoa have been variously estimated from 6,500,000 to 226,000,000 to an ejaculation. The former number seems the more reasonable.

The spermatozoa are about $\frac{1}{500}$ of an inch long, consist of a head, body and tail, and have extremely active motion. They are said to be able to travel one inch in seven and one-half minutes, and have, under favorable circumstances, remarkable vitality, having been found alive in the cervical canal of a woman eight days after copulation. They appear in the spermatic fluid about the fifteenth year of life and ordinarily disappear about the sixty-fifth year.

The Reception of Spermatozoa into the Uterus.—It has been found that the uterus of animals, under electric stimulation of the sexual organs, descends into the pelvis, grows shorter but broader, thereby causing the os uteri to open. The uterus, when the stimulation was removed, returned to normal and the os closed. It is supposed that these changes result in causing the uterus to exert a sucking action, and to suck the seminal fluid directly into the uterine canal. It frequently happens that spermatozoa, deposited in the vagina or even upon the external genitalia, make their way, by their own mobility, into the uterus, and conception results.

The meeting place of the spermatozoön and the ovum is generally accepted to be in the tube, at about the junction of its middle and outer third. Only rarely does conception occur in the uterus itself, though it is possible at any point from the peritoneum to the internal os.

Fertilization of the Ovum.—When the spermatozoön meets the ovum, its head penetrates the cell and the tail disappears. The head then becomes the male pronucleus, taking the place of the polar bodies cast off in the ripening of the ovum; fuses with the female pronucleus, and the development of the embryo is begun.

The average date of conception is following the first menstrual period after marriage. A marriage is not considered sterile until eighteen months have passed without conception, although women have not infrequently become pregnant after many years of apparent sterility.

Early Changes in the Development of the Ovum.—The segmentation nucleus of the ovum, formed by the fusion of the female pronucleus and the head of the spermatozoön is converted, by karyokinetic changes, into a di-aster. The ovum is then divided into two cells; each of these divided into two, and so on until the ovum is a mass of cells; the so-called *morula* or mulberry mass. Fluid then appears in the mass, and forces the cells out toward the periphery, transforming the ovum into a vesicular structure, with a single layer of cells surrounding a central cavity filled with fluid—the *blastodermic vesicle* or *blastula*. At one pole of the blastula the cells are concentrated into a flattened disc called the *blastoderm* or *embryonic area*. This consists of two kinds of elements, forming two distinct layers under the outer layer of cells. These two layers are known respectively as the *ectoderm* and *entoderm*, the ectoderm being the outer. *The embryonic area* becomes slightly elevated and forms an opaque zone known as the embryonic shield. In the middle of this shield appears the primitive streak, which in section is found to be a cord of cells in which offshoots from the ectoderm and entoderm fuse, and from the junction of which there extends on either side a third layer—the *mesoderm*.

As the mesoderm develops, it parts into two layers—the parietal and visceral layers—enclosing the celom or body cavity. The parietal layer unites with the ectoderm to form

the *somatopleura*, from which is developed the lateral and anterior abdominal walls. The inner or visceral layer unites with the entoderm to form the *splanchnopleura*, from which is developed the digestive tract and its associated organs.

The development of the embryo proper begins at the end of the second week.

STERILITY

In at least 40 per cent. of cases the fault lies with the male. In the female, the commonest causes are: (1) anteflexion

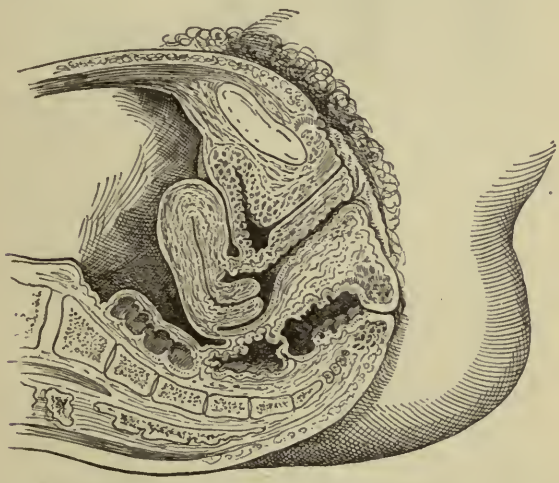


FIG. 9.—Anteflexion of the uterus, usually associated with stenosis of the cervical canal, and infantile development. One of the commonest causes of sterility.

and stenosis; (2) pelvic inflammation—endometritis or salpingitis; (3) retroversion of the uterus; (4) acquired stenosis of the cervix—the so-called one-child sterility—and (5) congenital lack of development or atresia of cervix, vagina or hymen, and psychic causes like vaginismus. It is not always possible to determine a cause upon examination.

Treatment.—Before any treatment of the wife is instituted, the husband should be examined to determine his power of

procreation. Obvious physical vigor does not necessarily mean power to procreate. If the husband is pronounced

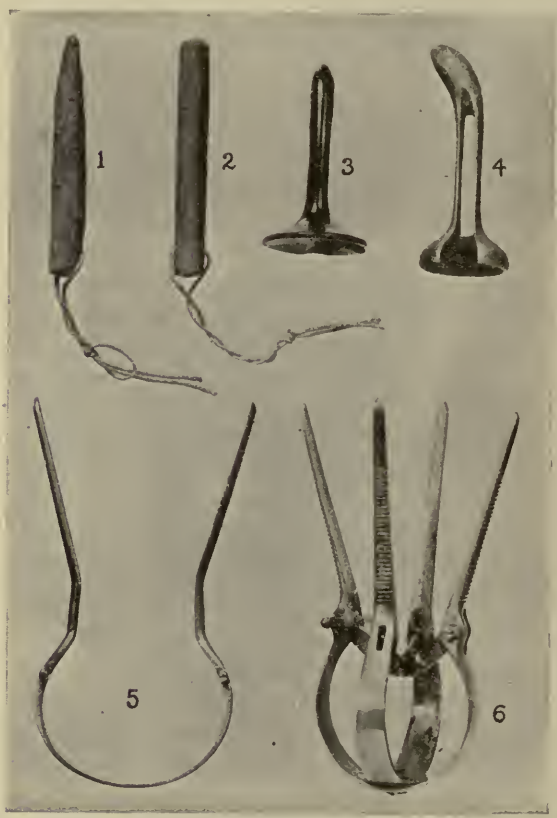


FIG. 10.—Instruments for maintaining dilatation of the cervical canal. 1. Sponge tent, expanding by the absorption of moisture. Impossible properly to sterilize. 2. Tupelo tent of porous wood. Open to same objection. 3. Stem pessary of hard rubber. 4. Wylie drain. 5. Schatz's two-bladed metranoikter. 6. B. C. Hirst's four-bladed modification of the Schatz.

capable, the most frequently required treatment for the wife is a dilatation and curettage—for anteflexion and stenosis.

This is done under anesthesia, branched dilators being used to secure a transverse dilatation of one inch. Very little curettage is done—only at each cornu. Excessive or frequently repeated curettage brings about a superinvolution of the uterus which may render the sterility incurable. Unless some means is taken to maintain the dilatation, it is rarely efficient. A *stem pessary* is dangerous and liable to be followed by infection; the same may be said of the Wylie drain—an aluminum or hard rubber plug worn in the uterus for several weeks following the dilatation; the *Schatz metranoikter*—preferably the four-bladed modification of B. C. Hirst—is the safest procedure. This is left in place for twenty-four hours, is then removed and the uterus washed out. Cases of atresia are managed by the proper restoration of the patency of the canal; retroversion—if not adherent—may be remedied by a pessary or operation; pelvic inflammation requires the cure of endometritis by intra-uterine instillations or by dilatation and curettage. Salpingitis requires abdominal or vaginal section to inspect and restore the patency of the fallopian tubes—a procedure of doubtful efficiency. Lack of development—the so-called infantile uterus—requires dilatation *without* curettage, electrical stimulation by the galvanic, rapid faradic and sinusoidal current, and hypodermic injections—intramuscularly—of 1 mil corpus luteum extract, given daily in series of 12 doses, with an interval of two to three weeks between series.

In sterility associated with obesity—the so-called dystrophia adiposogenitalis—it is advisable to use hypodermics of 1 mil of soluble extract corpus luteum, given daily in series of 24 doses, with an interval of two or three months between series, and a tablet of desiccated thyroid 2 grains, desiccated ovarian residue 2 grains, desiccated whole pituitrin gland 1 grain, desiccated suprarenal gland 1 grain—given as one tablet four times daily for 2 months at a time.

Electrical intra-uterine treatment is not without risk; any lapse in asepsis is likely to be followed by severe pelvic perito-

nitis and permanent sterility, so the method must be employed with due regard to this danger.

Sterility of long standing is sometimes relieved spontaneously and without treatment.

DEVELOPMENT OF THE FETAL APPENDAGES

The Amnion, Chorion, Placenta, Umbilical Cord and Deciduæ

The **amnion** is developed from the somatopleura, the ectoderm sending two reduplications backward, one from each side, over the dorsum of the embryo. These reduplications meet and fuse. Thus two cavities are formed—one within the fused membranes or the *true amnion*—the other, between the membranes and the outer covering of the embryo, or the *false amnion*. The amnion consists of a layer of young connective tissue, covered, on its inner surface, with a single layer of flat endothelial cells. It forms at term the *lining of the fetal surface of the placenta*, the *sheath of the umbilical cord* and the *inner layer of the membranes*. *Functions* of the amnion are: (1) To act as a covering of the child; (2) to furnish and contain the liquor amnii; (3) as a cushion to protect the child from shocks; (4) to dilate the cervix in labor.

Fig. 11.—Diagram showing completion of the amnion and formation of the chorion. (*Dorland.*) *A*, amnion; 1, zona pellucida; 2, outer lamina of the epiblast after closure of the amniotic folds; *P*, allantois; *U*, umbilical vesicle.

The *liquor amnii* is a slightly turbid, alkaline fluid, specific gravity 1010, and containing urea, albumen, sebaceous matter, lanugo, squamous epithelium, ammonium carbonate and urinary salts. It is greatest in amount at the sixth month of

pregnancy—about 3 pints; at term the average amount is one and one-half pints. It is derived partly from the mother, and partly, by excretion of urine, from the fetus.

The Chorion.—The formation of the chorion is probably one of the earliest changes that the human ovum undergoes. It is developed from the cell-wall of the ovum, and at first consists of two layers: an inner, thin layer of fine connective tissue and an outer composed of many layers of epithelial

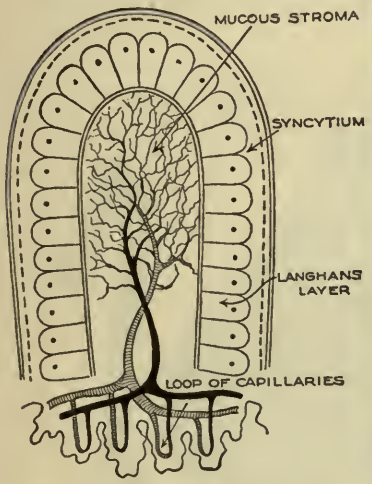


FIG. 12.—Diagram of chorion villus.

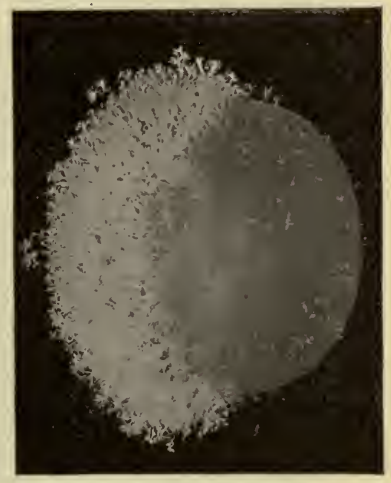


FIG. 13.—Six weeks' ovum, showing the chorion frondosum and chorion læve (*De Lee.*)

cells—the *trophoblast.* When the ovum reaches the uterine cavity, and is embedded in the decidua, the chorion sends out many fine finger-like processes, called *chorion villi.* They are composed of a finger-like process of mucoid connective tissue, covered by two layers of cells. The inner layer is called the Langhans' layer, and the outer, a band of protoplasm without marked cell divisions, and the nuclei running parallel to the surface, is known as the *syncytium,* and is instrumental later in starting the placental circulation. That part of the chorion in contact with the decidua serotina retains its villi,

which later form the placenta, and is known as the *chorion frondosum*. The rest of the chorion loses its villi, fuses with the amnion and decidua reflexa to form the membranes, and is known as the *chorion læve*. Until the third month, the villi of the chorion derive nutriment from the whole decidua serotina and reflexa; after the third month, from the serotina only. Each villus contains a loop of capillaries, derived from the vessels of the allantois.

The Placenta.—The ovum is attached to the decidua cover-

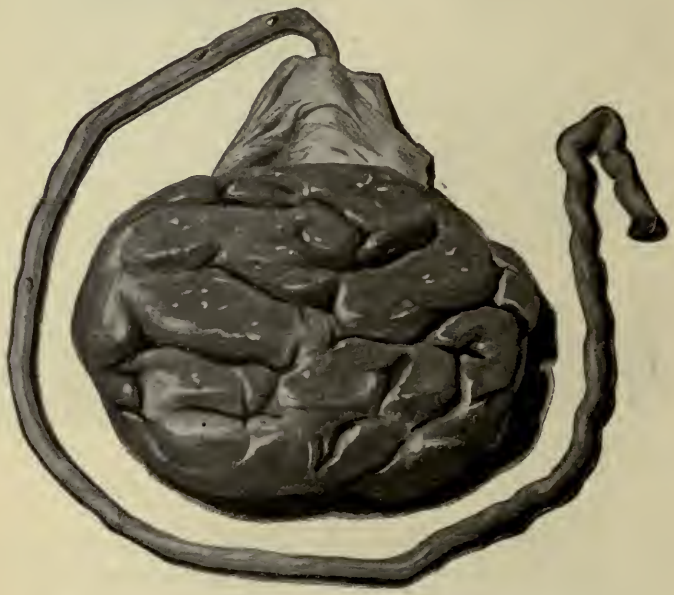


FIG. 14.—Normal placenta (maternal surface). (*De Lee.*)

ing the anterior or posterior wall of the uterus, usually near the fundus. About the sixth week of pregnancy the blood supply of the decidua serotina becomes more and more abundant, while that of the reflexa is diminished. Hence, the chorionic villi in relation with the serotina, receiving all the nourishment they need, begin to proliferate rapidly. Many of the

villi penetrate deeply into the decidua. From these later, outgrowths or *buds* of syncytium are sent out, which open

FIG. 15.—Normal placenta (fetal surface). (*De Lee.*)

the maternal blood-channels in the decidua, so that blood is poured out around the villi; the blood is taken up by the villi, by a process of osmosis, and is carried by the capillaries in the

villus, to the fetus. The placenta begins to functionate about the third month of pregnancy.

The Placenta at Full Term.—The placenta at term is a flattened, circular organ about seven inches in diameter, one inch thick and weighing about one pound. The *maternal surface*, which was in contact with the decidua serotina, presents a ragged, torn appearance, and is divided by depressions into a number of parts, or *cotyledons*. The *fetal surface* is smooth and glistening, covered by amnion, and a mass of large, distended interlacing blood-vessels. The *umbilical cord* is inserted usually near, but not at, the center of the fetal surface. The *membranes* hang like a veil from the periphery of the placenta and are composed, as has been said, of the amnion, the chorion læve, and the decidua reflexa. The circular sinus of the placenta is the name given to a large vein which often skirts a considerable portion of the periphery of the placenta, rarely completely encircling it.

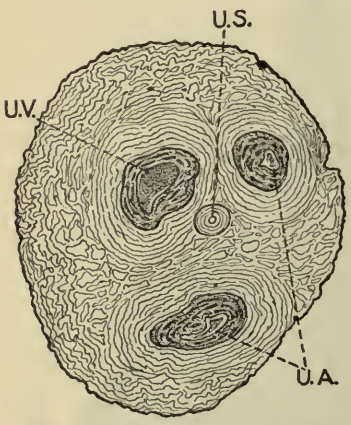


FIG. 16.—Diagram of umbilical cord in cross-section. *U.V.*, umbilical vein; *U.A.*, umbilical arteries; *U.S.*, remnant of umbilical stalk.

The Umbilical Cord or Funis.—About the twentieth day of pregnancy, there occurs a sac-like projection of the posterior end of the intestinal tract. This projection grows outward until it reaches the periphery of the ovum, and contains blood-vessels. Within the allantois these vessels are reduced in number to two arteries and a vein. The arteries convey venous blood from the fetus to the mother; the vein arterial from the mother to the fetus. The vessels are embedded in a gelatinous substance called the *jelly of Wharton*.

The Cord at Term.—The umbilical cord at term is about twenty inches long, one-half thick, and has a dull white moist appearance. In structure it may be roughly compared to a candle with two pieces of string wound around it. The wax of the candle represents the jelly of Wharton, the wick the umbilical vein and the pieces of string the umbilical arteries. The arteries are twisted eight to ten times around the cord, from right to left. The narrowest portion of the cord is usually at a point about two inches from the umbilicus of the child.

The Decidua.—The decidua is the name given to the mucous membrane of the uterus, when it has undergone the changes dependent upon pregnancy. These changes begin very shortly after the fertilization of the ovum, although the exact time is uncertain. The endometrium becomes very much thickened, and its surface marked by deep furrows, giving it a very rough appearance. It is thickest about the fourth month of pregnancy. From that time until term it gradually atrophies, except at the placental site. The stroma cells hypertrophy until they attain eight or ten times their original size.

Microscopic Appearance.—Under the microscope the decidua is seen to be composed of two layers; a *compact* layer, made up of the hypertrophied stroma cells of the endometrium; and a *spongy* layer, containing the dilated uterine glands.

The cells of the compact layer are round, oval or sometimes polygonal; epithelioid in type with large vesicular nuclei. The ducts of the uterine glands, in the early stage of the formation of decidua, are seen running through the compact layer to the surface, but these ducts finally disappear, and in the later months, no trace of them can be seen. The glands of the spongy layer are at first lined with the cylindrical epithelium typical of the uterine glands. This gradually becomes cuboidal and a great part of it is cast off into the lumen of the gland and lost. A certain amount remains intact, and from it the endometrium is regenerated during the puerperium. The decidua is very richly supplied with blood, especially in

the deeper layers. According to the functions of the decidua, it is usually considered under three heads: the *decidua vera*, the *decidua reflexa*, and the *decidua serotina*.

The *decidua vera* is the name given to all the decidua lining the uterine cavity, except that portion to which the ovum is attached, and the portion reflected over the ovum. Its struc-

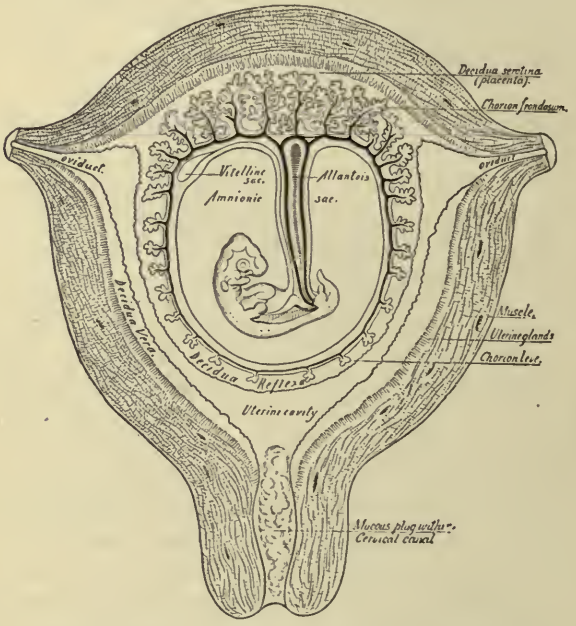


FIG. 17.—Cross-section of uterus at the end of seventh week of pregnancy, showing the relation of the decidua and other fetal structures. (Modified from *Allen Thomson*.)

ture has been described above. It atrophies after the fourth or fifth month of pregnancy, so that at term it is only about 2 to 3 mm. thick. When the impregnated ovum enters the uterine cavity, it drops into one of the deep furrows in the decidua, usually near the fundus on the anterior or posterior wall. It is covered in by the arching over of the sides of the furrow, and

their agglutination. As the ovum develops, the decidua covering it is pushed out into the uterine cavity, forming a kind of capsule for the growing ovum, and is known as the *decidua reflexa.* This portion of the decidua is greatest in amount at about the second month of pregnancy. About the fourth month, the decidua reflexa is brought, by the growth of the ovum, into intimate contact with the vera, fuses with it, and gradually degenerates and disappears. This is the most widely accepted theory, but some observers, notably Peters, in describing what he believed represented a three days' human ovum, and Selenka, in his studies of monkeys, state that the ovum actually penetrates the surface epithelium and burrows down into the decidua vera. They claim that the decidua reflexa is merely that portion of the vera which covers the ovum and undergoes passive enlargement as the ovum grows. The point is, however, still under discussion.

The *decidua serotina* is the portion of the decidua lying immediately beneath the ovum, and which represents the placental site. It is often called *placental decidua.* It is the portion of the decidua richest in blood-vessels, which are very numerous, usually run a spiral course, and penetrate the entire thickness of the membrane. The placenta is attached to this portion of the decidua. During the third stage of labor, when the placenta is separated from the uterine wall, the line of separation is usually between compact and spongy layers. The compact layer is cast off, adhering to the maternal surface of the placenta; from the spongy layer the endometrium is regenerated during puerperium.

The Fetus at Different Months in its Development

It is not intended to take up the characteristics of the embryo and fetus at each month of its development, but merely to consider briefly the more important points.

First Month.—During the first two weeks the embryo consists largely of the yolk-sac. The embryonal period begins

with the third week when the embryo is divided into head, body and tail. About the twenty-first day the limbs make their appearance as small buds. In the fourth week the embryo increases greatly in size, its head and tail are almost in contact, and its back markedly arched. It is about one-half an inch in length.

Third Month.—The embryo is about three and a half to four inches in length, and weighs about an ounce. Centers of ossification are found in the bones. The fingers and toes lose their web and become differentiated. The trunk is divided into thorax and abdomen by the appearance of the ribs. The sex is distinguishable by the presence or absence of a uterus, and the placenta commences its functions.

Sixth Month.—The fetus is about twelve inches long and weighs one and one-half pounds. The subcutaneous fat is being developed and the skin beginning to lose its wrinkled appearance. The head is relatively very large. If born at this time it may live one to fifteen days.

Seventh Month.—The fetus is fifteen inches long and weighs forty-one ounces. The body is covered with lanugo, and the pupillary membrane disappears. If born at this time, it may survive, but more often dies. The old Hippocratean doctrine, still generally believed among the laity, that a child born at the seventh month has a better chance of surviving than one born at the eighth, is erroneous.

Eighth Month.—The fetus is sixteen inches long and weighs three and a half pounds. Of children born at this time 40 to 75 per cent. are saved.

Ninth Month.—The fetus is eighteen inches long and weighs about four and one-half pounds. If born, will certainly live, if given ordinary care.

These figures are based upon a duration of pregnancy of 40 weeks or 10 lunar months.

The fetal circulation differs from the ordinary circulation in several important points. The blood is carried through the umbilical vein to the umbilicus, thence along the anterior

abdominal wall to the outer surface of the liver. Here the vein divides into two, the larger emptying into the portal vein; the smaller, called the *ductus venosus*, into the ascending cava. From the ascending cava the blood goes to the right auricle. As the lungs are not functionating, the bulk of the blood passes into the left auricle, directed by the Eustachian valve through the *foramen ovale*, an opening in the interauricular septum. From the left auricle it goes to the left ventricle and thence into the aorta, and thence primarily to the upper extremity of the fetus. As the lungs need only sufficient blood for their nutrition, an outlet is provided for the excess entering the right auricle and ventricle from the descending vena cava in the *ductus arteriosus*, a large branch opening into the aorta from the pulmonary artery. The aorta thus conveys mixed blood to the trunk and lower extremities. From each internal iliac a vessel, known as the hypogastric artery, ascends to the umbilicus. These vessels become the umbilical arteries in the cord, and return the blood to the mother for oxygenation.

The Mature Fetus

The characteristics of the mature fetus are briefly:

1. Weight, 7 to 7.5 pounds. The weight of full-term children varies from an extreme of one pound to one of twenty-eight and three-quarters pounds, this latter being the child of the "Nova Scotia Giantess." Anything over twelve pounds is very rare.
2. Length, twenty inches.
3. Face plump and rosy and subcutaneous fat well developed.
4. Lanugo disappeared.
5. Vernix caseosa is abundant only on the flexor surface of the limbs and the back.
6. Finger-nails project beyond ends of fingers.
7. Bones of head are firm.
8. Child moves and cries vigorously.

HEAD MEASUREMENTS

Bitemporal	8.0 cm.	(3.15 in.)
Biparietal	9.5 cm.	(3.64 in.)
Occipitomental	13.0 cm.	(5.12 in.)
Occipitofrontal	11.75 cm.	(4.56 in.)
Trachelobregmatic	9.5 cm.	(3.74 in.)
Suboccipitobregmatic	9.5 cm.	(3.74 in.)
Circumference (occipitofrontal)	34.5 cm.	(13.5 in.)

The Centers of Ossification.—In the mature fetus the center of ossification in the lower epiphysis of the femur is 5 mm.

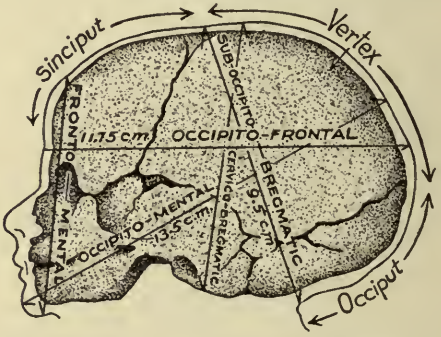


Fig. 18.—Child's head at term and diameters.

in diameter. That in the upper epiphysis of the tibia is just appearing. In the humerus they do not appear for several months after birth.

The predetermination of sex is not possible. Various methods of controlling the sexes have been put forward, notably that of Schenk of Vienna, but are we still in ignorance of the laws governing the production of sex. The proportion at birth is 106 boys to 100 girls. The boys have a slightly higher death rate than girls, so that at puberty the numbers are about equal.

Multiple Fetation.—Twins occur once in about 120 pregnancies (1–80 in Europe). Triplets occur once in 7910; quadruplets once in about 371,000 births. There are about

100 cases of quintuplets on record, and only one or two reliable cases of sextuplets. Accounts of more than six children at a birth, though frequently reported in the middle ages, must be considered apocryphal.

Causes.—Heredity seems to play an important part. Roughly speaking multiple pregnancies result from:

1. Fertilization of two or more separate ova, when the children each have their own chorion, amnion and placenta (which may be fused into one). They are not necessarily of the same sex.

2. The complete segmentation of one impregnated ovum into two or more parts. In this case the children have a common chorion and placenta, but each has its own amnion. They are always of the same sex, resemble each other closely, and are called *homologous twins.*

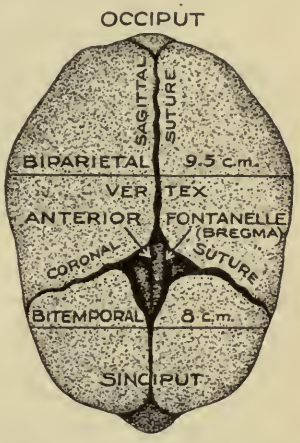


FIG. 19.—Child's head at term and diameters.

Two other theories of the production of multiple pregnancies: (1) the penetration of the ovum by two or more spermatozoa and (2) the impregnation of ova escaping from different graafian follicles at different times (*superfetation*) do not meet with wide acceptance.

Hydramnios is very common in twin pregnancies, affecting usually one sac only. It sometimes happens that one fetus is outstripped in growth by its fellow. The weaker finally dies and is pressed flat against the uterine wall. When born it resembles a flattened mummified child, and is called a *fetus papyraceus.*

CHAPTER III

PHYSIOLOGY, DIAGNOSIS, AND DIFFERENTIAL DIAGNOSIS OF PREGNANCY

CHANGES IN MATERNAL ORGANISM

Abdominal Walls.—The abdominal walls during pregnancy are, in the later months, greatly overstretched, and consequently certain marks or scars called striæ are formed. These striæ are due to the fact that the deeper layers of the skin are not as elastic as the upper and break in many places instead of stretching. If the stretching of the abdominal wall is painful it can often be relieved by inunctions of cocoa butter or olive oil. The abdomen usually presents a marked pigmentation surrounding the umbilicus and extending in the middle line downward to the symphysis and upward half way to the xiphoid cartilage—the *linea nigra.*

Breasts.—The changes in the breasts will be found in the section on the symptoms of pregnancy.

Weight.—There is ordinarily an increase of about one-thirteenth of the body weight in pregnancy.

Circulation.—The total quantity of blood is increased, but its constituent parts do not keep the same relation. The watery element is most markedly increased. This is sometime called the physiologic *hydremia* or *anemia* of pregnancy. There is also a moderate leukocytosis.

Blood-pressure in Pregnancy.—The normal systolic blood-pressure in pregnancy is 118 to 125 mm. of mercury. It shows a tendency to rise slightly in the last four weeks. The diastolic pressure is not of so much importance, though too wide a divergence between systolic and diastolic should lead to suspicion of myocarditis and be watched accordingly. The mercury column sphygmomanometers like the Nicholson, or

the dial instruments like the Tycos are the ones in most common use. A record of the blood-pressure should be kept every two weeks until the last month and then every week.

Urine.—The urine is usually increased in pregnancy, especially the watery elements. The total quantity of solids is about normal.

Bladder.—The bladder shows, in the early months of pregnancy considerable irritability, due to the pressure of the uterus upon it. As pregnancy advances, the bladder rises out of the pelvis with the uterus and becomes an abdominal organ. Its capacity is diminished, due to its position between the growing uterus and the anterior abdominal wall.

Vagina.—Due to the increased blood-supply, the most characteristic changes are the purplish color and the more copious secretion. The elements composing the vaginal wall hypertrophy. The vaginal secretion is intensely acid in reaction, due to Döderlein's bacillus, which secretes lactic acid. Normally the vagina contains no pathogenic bacteria.

Cervix.—The cervix is somewhat hypertrophied, broader, softer, but its length is unaltered. The cervix is plugged during the whole of pregnancy with a plug of tough mucus.

The Uterus.—The muscle fibers of the uterus increase enormously in size during pregnancy. The number of fibers is very slightly increased if at all, so that the size of the uterus is due to a hypertrophy and not a hyperplasia. It increases from an organ having a length of two and one-half inches and a weight of two ounces (capacity 16.5 mils or 1 cubic inch) to one twelve inches long and weighing two pounds (capacity 6600 mils or 400 cubic in.). The uterine walls are thickest up to the fourth month; from then on they become somewhat thinner, so that at term they are rarely more than ½ to 1 cm. thick. During the first three months the uterus is sharply anteflexed. As pregnancy advances, this is gradually but never entirely corrected. The uterus is almost always rotated toward the right, due to the pressure of the rectum and sigmoid flexure upon the left side. At term, the uterus reaches

about half way from the umbilicus to the xiphoid, with the intestines massed above and behind it; the anterior uterine and abdominal walls are usually in contact.

The *blood-vessels of the uterus* are greatly increased in caliber and are very tortuous.

The *lymphatics* are greatly dilated; those below the mucous

FIG. 20.—The relation of the pregnant uterus at term to the intestines. (*B. C. Hirst.*)

membrane particularly. From them lead tubes the size of goose-quills through the uterine muscle, which are collected under the peritoneal covering in an intricate plexus.

The *muscle fibers* are irregularly arranged in three layers—an outer, middle and inner layer. The outer is mainly longitudinal; the middle forms a dense network containing the majority

of the large vessels; the inner is circular and poorly developed except in the cervix and at the openings of the tubes.

The **ovaries** and **tubes** undergo chiefly a great increase in vascularity. There is ordinarily no ovulation during pregnancy; and the ovary from which the fertilized ovum was discharged is the site of the corpus luteum of pregnancy.

The **pelvic joints,** especially the sacro-iliacs, are somewhat loosened. This is sometimes enough to interfere with walking and to require a binder for support.

THE SYMPTOMS OF PREGNANCY

The symptoms of pregnancy are divided into two classes: those noted by the patient herself, called *subjective*; and those elicited by the physician during his examination—the *objective symptoms*.

Subjective Symptoms.—The subjective symptoms, arranged approximately in their order of importance are:

Cessation of Menstruation.—While this is the most important, it does not necessarily mean pregnancy. Its cessation, independent of pregnancy is most commonly due to (1) Change of climate, (2) cold, (3) fear of or desire for impregnation, (4) anemia, (5) pelvic inflammation or tumors. On the other hand, menstruation may persist for three months or more after impregnation or rarely throughout the whole pregnancy.

Nausea and Vomiting.—The nausea and vomiting of pregnancy begins as a rule at about the sixth week. It lasts about six weeks and is usually more pronounced in the morning, when the woman first arises, as the change from a horizontal to erect posture increases pelvic congestion. It may be increased by anything that produces pelvic congestion, irrespective of pregnancy, or a disordered stomach. Again it may be entirely absent.

For details as to treatment see section on toxemia of pregnancy.

Change in the Size and Shape of the Abdomen.—The shape

and size of the abdomen in the early months of pregnancy offers no help in the diagnosis of pregnancy. In the latter months it steadily enlarges and assumes the pyriform shape characteristic of the pregnant uterus. This shape may be simulated by fat in the omentum and abdominal walls, ascites, fibroid tumor, ovarian cyst, overdistended bladder and, rarely, tympanites.

Changes in the Breasts and Genitalia.—These are due to increased blood-supply, and usually take the form of increased warmth or tingling sensations. The fullness of the breasts and the presence of colostrum may be noticed by the patient. The same sensations are not uncommon at each menstrual period.

Quickening.—This name is given to the sensations experienced by the mother when the fetal movements are first felt. It was formerly erroneously thought to mark the time when life was imparted to the child. It occurs usually between the fourth and fifth month. The movements may be felt as early as the third month.

They may not be noticed at all; or a woman earnestly desiring maternity and believing herself pregnant may be conscious of peristaltic movements of her intestines and mistake these movements for those of a fetus.

Nervous Phenomena.—The chief disorders of the nervous system are a tendency to dizziness and fainting, a change in disposition, inordinate appetite or perversions of appetite and taste.

None of the subjective signs of pregnancy are positive signs; all of them can be simulated by other conditions, and they should be considered, not by themselves, but in connection with other evidences of pregnancy elicited by the physician in his examination.

Objective Symptoms.—For convenience in study, the objective signs of pregnancy are here grouped by localities.

Face.—Occasionally there is marked brownish pigmentation of the forehead, temples and skin over the malar bones,

amounting sometimes to positive disfigurement. It usually disappears promptly after delivery, but rarely is permanent.

Breasts.—The breasts become (1) more prominent; (2) present a pigmentation of the areola, the color changing from pink to a reddish-brown or even dark brown; (3) the development of the secondary areola; a slightly irregular deposit of pigment outside of the primary areola; (4) enlarged veins are seen coursing over the breasts; (5) the skin becomes

FIG. 21.—The breast near term, showing primary and secondary areola. (*De Lee.*)

marked with striæ; (6) the glands of Montgomery in the areola are prominent; (7) colostrum can be expressed from the nipple, especially in the later months.

Abdomen.—The abdominal contour shows (1) the presence of a pyriform tumor; (2) the striæ and linea nigra are usually well-marked; (3) at intervals the abdomen becomes hard, and the uterus more prominent—the intermittent contraction or Braxton-Hicks' sign; (4) the head, body and extremities of

the fetus can be mapped out; (5) the fetal movements can be felt and seen; (6) the fetal heart sounds can be heard and counted. The placental or uterine bruit can usually be heard and the funic souffle occasionally. The uterine bruit has no diagnostic significance, being often heard in tumors.

Vagina.—These are the more important signs, especially in the early months of pregnancy. (1) Blue discoloration of the vaginal mucous membrane, becoming purple in the later

FIG. 22.—The outline of the pregnant uterus at term. (*B. C. Hirst.*)

months. (2) Frequently a band of bright scarlet around the fourchet. (3) Softening of the cervix. "When the cervix is as hard as the cartilage of one's nose, pregnancy is unlikely. When as soft as one's lips, pregnancy is likely" (Goodell). (4) Hypertrophy of the cervix—becoming broader. (5) Softening of the lower uterine segment or Hegar's sign. (6) Jug-shaped enlargement of the uterus above the internal os. (7) The presence of the presenting part. (8) *Ballottement*—or the sensation imparted by the presenting part when it is lightly pushed, floats away in the liquor amnii, and then falls back

upon the examining finger. This symptom can be simulated by a small ovarian cyst or uterine fibroid with a long pedicle.

FIG. 23.—Striæ on the abdomen. (*De Lee.*)

THE SIGNS OF PREGNANCY PRIOR TO THE THIRD MONTH

Subjective Signs.—(1) Cessation of menses; (2) nausea; (3) changes in breasts; (4) nervous phenomena.

Objective Signs.—*Breasts:* (1) enlarged; (2) engorged veins; (3) enlarged Montgomery's glands; (4) pigmented areola; (5) colostrum.

Abdomen.—None.

Vagina.—(1) Scarlet discoloration; (2) blue discoloration;

(3) soft cervix; (4) hypertrophied cervix; (5) Hegar's sign; (6) jug-shaped uterus.

The Positive Signs of Pregnancy.—The only signs which can be called positive are:

1. *Fetal Heart Sounds.*—A double sound, beating at the rate of 120 to 160 to the minute. It sounds much like the ticking of a watch under a pillow. A single beat is most likely the pulsation of the mother's aorta, transmitted through the

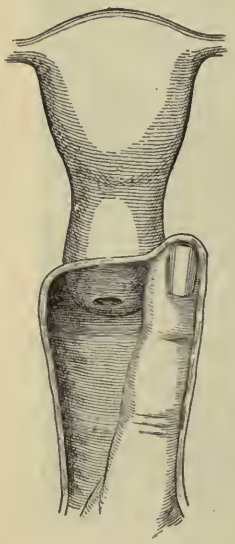


FIG. 24.—The shape and size of the non-pregnant uterus. (*Budin.*)

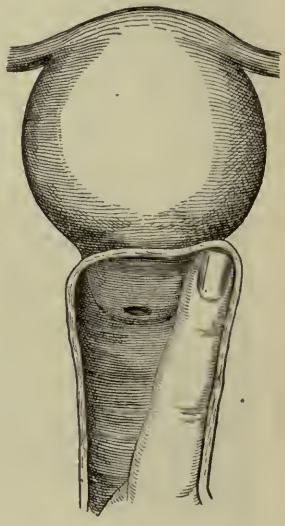


FIG. 25.—The shape and size of the uterus altered by early pregnancy. (*Budin.*)

uterus. It can be differentiated by noting that it is a single sound, and is synchronous with the mother's heart beats.

2. *Fetal Movements.*—These are of two kinds: the sharp tap of the extremities and the heave of the child's back. The twitching of the abdominal muscles must not be mistaken for them.

3. *Braxton Hicks' sign* or the intermittent contractions of the uterus, at intervals of 10 to 15 minutes. They can be

felt; the abdomen becomes hard during a contraction and the outline of the uterus much more prominent. They can be simulated by the contractions of a greatly overdistended bladder, and also by the contractions of the uterus over a large single submucous fibroid, but these conditons are so uncommon that it is justifiable to include this sign among the positive signs of pregnancy.

4. The *x*-ray can usually be depended upon to show a satisfactory shadow of the fetal skeleton, after the sixth

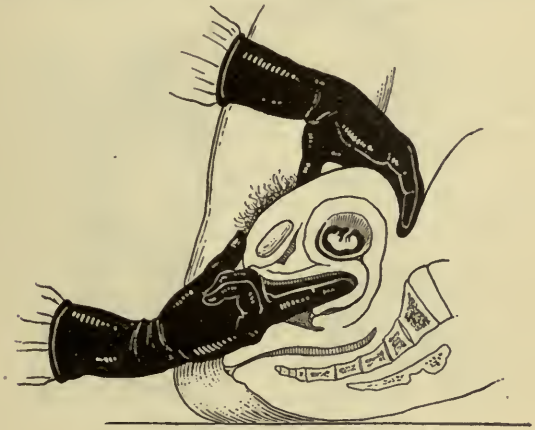


FIG. 26.—Hegar's sign of pregnancy.

month of pregnancy. Not infrequently, however, even at full term, the shadow is doubtful or entirely absent.

DIFFERENTIAL DIAGNOSIS OF PREGNANCY FROM CONDITIONS SIMULATING IT

The conditions most likely to be mistaken for pregnancy are: (1) Fibroid tumor; (2) ovarian cyst; (3) ascites; (4) omental and abdominal fat; (5) tympanites and (6) overdistended bladder.

Fibroid Tumor.—The special symptoms by which a fibroid can be recognized are:

(1) More often menorrhagia than amenorrhea.

(2) A very bold and often irregular outline to the abdominal tumor.

(3) On palpation the tumor is hard and knobby.

(4) Absence of fetal heart sounds and movements. The outline of a fetal body is frequently simulated by the knobs of a fibroid in an astonishing manner.

Ovarian Cyst.—(1) An oval instead of pyriform abdominal tumor.

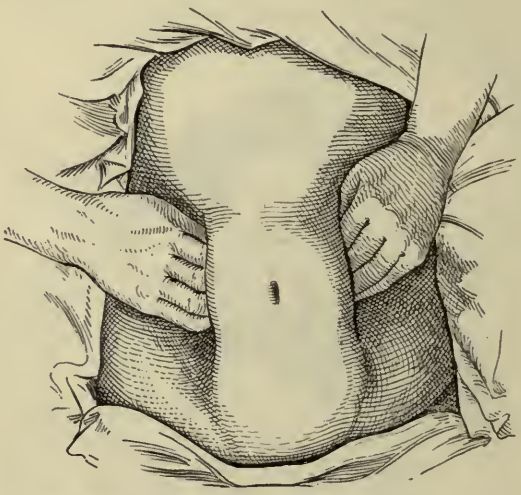


FIG. 27.—Testing the actual outline of the abdomen by eliminating the superficial fat.

(2) Often vicarious menstruation or persistence of menstruation.

(3) Absence of the *objective* signs of pregnancy, though the subjective may be perfectly simulated.

(4) By vaginal examination the uterus is found small, hard and often pushed far to one side.

Ascites can usually be diagnosed by the dullness in flanks and tympany in the center of the abdomen; the characteristic flattened abdomen with prominent flanks when the patient is recumbent, and the absence of the objective signs of pregnancy.

Omental and abdominal fat can be diagnosed by noting the thickness of the abdominal wall; by the doughy consistency of the abdominal tumor and by the absence of the objective signs of pregnancy.

Tympanites is diagnosed by the tympany over the entire abdomen, even upon deep percussion, and the absence of all objective symptoms of pregnancy, especially by vaginal examination. It must be remembered that tympanites may exist with pregnancy if, as sometimes happens, the intestines prolapse between the uterus and abdominal wall and become distended.

Overdistended Bladder.—Here the catheter gives an unfailing means of diagnosis. The bladder may be enormously distended; one in the author's service at the Philadelphia General Hospital contained 170 ounces.

In any case of doubt, an examination under an anesthetic may be necessary. It must be remembered that pregnancy can exist with any of the above conditions, and that the diagnosis of early pregnancy complicated by any one of them is often extremely difficult, and can only be made by a careful, detailed search for the objective symptoms of pregnancy. The subjective symptoms can be so closely simulated as to render them useless for diagnostic purposes.

METHODS OF PRECISION IN DIAGNOSIS OF PREGNANCY

Abderhalden Test.—The serologic diagnosis of pregnancy. A fresh piece of human placenta is washed and boiled. It is covered with the blood serum (10 mils) of the woman to be tested, placed in a dialysation tube, which is then hung in a vessel of distilled water. After dialysation has progressed for sixteen hours, in the incubator, the dialysate is tested for protein derivatives by ninhydrin. If they are present, a blue color appears. The technic is difficult; the results uncertain. Eighty-five per cent. of women give a positive reaction at the menstrual period, and a positive reaction can sometimes be obtained in the blood of a man.

Placentin Test.—The injection of a placental extract intradermically should be followed by a local reaction somewhat similar to the von Pirquet reaction in tuberculosis. This has a high percentage of error, and is useless except in primiparæ.

X-ray.—The fetal skeleton is transparent to the rays prior to the sixth month of pregnancy. Hence this method is not available in the early diagnosis.

Duration of pregnancy is 273 days, if counted from impregnation of the ovum of the *last* period; or 252 days if counted from impregnation of the ovum of the *missed* period. Labor occurs on an average of 269 days after a single fruitful coitus, but the junction of the ovum and spermatozoon is not immediate.

Pregnancy is prolonged over 300 days in 6 per cent. of women. Sometimes as long as 320 days or longer. The law of legitimacy (Napoleonic Code) recognizes the legitimacy of the child born 181 to 302 days after conception.

Missed labor is the occurrence of a few pains at the expected term and then their subsidence and inaction for a variable period.

Estimation of the date of labor is usually done by counting back three months from the date of the last menstrual period, and adding seven days. This gives approximately the date of labor. In April and September six days; in December and January five days and in February four days are to be added. When the menstrual history is uncertain or when the patient has conceived during lactation we can arrive at an approximate idea from (1) the height of the fundus uteri; (2) the date of quickening (four and one-half to five months); and (3) the occurrence of subsidence of the uterus (one to two weeks before term).

The height of the fundus at the different months is:

Fourth month—just above the symphysis.

Fifth month—half way from symphysis to umbilicus.

Sixth month—at the umbilicus.

Seventh month—four fingers breadth above the umbilicus.

Eighth month—half way from the umbilicus to the xiphoid.

Ninth month—at the xiphoid cartilage.

Tenth month—descends to the location at the eighth month, when the presenting part enters the superior strait.

Signs of Patient being at Full Term.—*History.*—She describes the occurrence of subsidence of the uterus, with considerable increase of pressure in the pelvis, backache and irritability of the bladder.

Abdominal Examination.—The fundus uteri is one-half way from the umbilicus to the xiphoid; the child's back is

FIG. 28.—Silhouettes of a patient before and after subsidence of the uterus, or lightening, has occurred. (*De Lee.*)

about twelve inches long, and the head has obviously entered the superior pelvic strait.

Vaginal Examination.—The child's head is low down and well engaged in the superior strait; the cervix is somewhat shortened and possibly has begun to dilate, admitting one finger.

All these signs indicate that labor is fairly imminent, and have their greatest importance in primiparæ.

Examinations Necessary in Pregnancy.—In a normal pregnancy the patient should be examined at least three times. The first examination is made at the time she consults the

physician, to engage him for her confinement. It should consist of a careful search for the symptoms of pregnancy, that the correct diagnosis be established; a further vaginal examination to determine whether there exist any deformity or anomaly likely to make the labor difficult; a careful measurement of the maternal pelvis and an examination of the patient's heart and lungs.

The second examination should be made four weeks before term. It should be directed chiefly toward ascertaining the size of the child and proportionate relations of the presenting part to the pelvic inlet. In this way can be recognized any overgrowth of the infant, and labor can then be induced from two to four weeks before term.

The third examination is ordinarily made two weeks before term. In this the position of the child should be carefully mapped out. The method of making the diagnosis will be given here; the reasons for and frequency of the different presentations belong to the section on the mechanism of labor. The patient is arranged flat on her back on a bed or suitable examining table; her clothing should be arranged to expose the abdomen and a sheet should then be thrown over her, so that there is no unnecessary exposure. The abdominal examination should be made through this sheet.

The most easily palpable portion of the fetus is the back. Its position is diagnosed by making pressure with the finger tips on one side of the abdomen, gradually moving them across to the other side in a series of tapping movements. The back can be felt giving a broad, even sense of resistance on one side, in contrast to the softer cystic feel of the rest of the uterus. The extremities can usually be felt in the upper portion of the uterus, on the side opposite that on which the back was found. The examining hand outstretched makes a series of rubbing movements over that portion of the uterus, and the extremities are felt as hard cylindric bodies which move away from the examining hand as it displaces them or as the child itself changes their position.

The head is the presenting part in 95 per cent. of all cases, and can be felt above the superior strait. For this examination the physician stands by the patient's side, facing her feet. His finger-tips are placed upon the abdominal wall just above Poupart's ligament, on either side, the middle finger corresponding to the middle of the ligament. Pressure is then made gently in a direction downward and inward, and the head can be felt between the finger-tips. A fairly accurate idea of its size can be gained in this way, and also its relative size to the pelvic inlet, by trying to force the head into the pelvis.

Auscultation.—By auscultation can be heard the fetal heart sounds, the fetal movements, the uterine and funic souffles. The fetal heart sounds have already been described. They are heard most plainly over the fetal back. In a left occipito-anterior position of a vertex presentation they are heard most plainly at a point one inch below and one inch to the left of the umbilicus. In right occipito-anterior positions, one inch below and to the right of the umbilicus. In right or left occipitoposterior positions, on a line one inch below the umbilicus in the right or left flank. In breech presentations *above* the umbilicus and in transverse presentations just above the symphysis.

Diagnosis of Prior Pregnancy.—The signs usually left by a prior pregnancy are:

1. Breasts pendulous, areola darkened and often striæ.
2. Abdominal walls flaccid and marked by striæ.
3. Frequently diastasis of the rectus muscles.
4. Destruction of the hymen and presence of myrtiform caruncles.
5. Possibly laceration or relaxation of perineum.
6. Vaginal walls smooth and rugæ lost.
7. Cervix cylindric instead of conic.
8. Possibly cervical lacerations.
9. Change in external os from a circular opening to a transverse slit.

These are of importance in medicolegal work.

Diagnosis of Death of Fetus.—Usually, upon the death of the fetus, spontaneous abortion occurs. In early pregnancy the disappearance of the subjective signs; the appearance of milk in the breasts; the failure of the abdomen to enlarge when measured from week to week are important presumptive signs.

In late pregnancy, the failure of the abdomen to enlarge; the disappearance of fetal heart sounds and fetal movements that had previously been heard, seen and felt would indicate the death of the child.

When the membranes are not ruptured the product of conception does not putrefy; it macerates, and may be retained for months. In all cases of doubt, assume that the child is alive.

Predetermination of Sex.—Is not possible, except in a breech presentation in labor. The normal ratio is 106 boys to 100 girls at birth. The death-rate in boys is somewhat higher than girls, so that at puberty the sexes are about equal.

Pseudocyesis or **spurious pregnancy** is the name given to a condition in which the patient firmly believes that she is pregnant. It is most often seen in women intensely anxious for or in dread of maternity, or in those whom an abdominal enlargement from some cause, most often obesity associated with amenorrhea, has led them to suspect pregnancy. Usually a positive assurance that she is not pregnant is sufficient to convince the patient, but occasionally even the most positive statement will fail to disabuse her of the idea.

MANAGEMENT OF NORMAL PREGNANCY

The following are the more important rules for the management of pregnancy:

1. A specimen of urine (four ounces mixed night and morning) should be sent for examination every two weeks until the last month; then every week.

2. The patient should report at once any persistent head-

ache, failure of vision or digestive disturbances, bringing a specimen of urine with her.

3. The blood-pressure should be taken every two weeks until the last month and then every week.

4. She should eat a carefully selected diet, meat or the more nitrogenous vegetables only once a day, and an excessive appetite should not be gratified.

5. Her exercise should be reduced below what she has been in the habit of taking, and all violent forms avoided.

6. She should not lift weights of any kind.

7. She should guard against exposure to cold and wet, and should wear rubbers in wet weather.

8. The nipples should be treated twice daily with glycerole of tannin and water, equal parts, for the month preceding confinement.

9. She should use regularly, a mouth wash of milk of magnesia.

10. She should be particularly careful at the time corresponding to what would have been a menstrual period.

Coitus in pregnancy is unwise at any time. It is most dangerous in the first three months, and, particularly, in the last six weeks. The chief dangers are abortion; aggravation of the nausea and vomiting in early pregnancy, often causing it to become pernicious; infection, at any time in pregnancy, but particularly in the last few weeks. It is wisest to explain the risks to the patient and her husband, and advise against the practice entirely. The risk is least in the middle three months of pregnancy, except at the time that would ordinarily have been a menstrual period.

CHAPTER IV

NORMAL LABOR (EUTOCIA)

Causes of Labor.—The onset of labor is due to a combination of causes, the chief of which are:

1. *Maturity of the Ovum.*—During the last month of pregnancy the attachments of the child to the uterus are loosened, by a process of fatty degeneration, so that at term it is practically a foreign body in the uterus, and as such, stimulates the uterus to contract. This process is analogous to the ripening of fruit on a tree; its attachments becoming so loosened that a slight jar is sufficient to sever them.

2. *Periodicity.*—The average date of labor corresponds to what would have been the tenth menstrual period, dating from conception; a time at which the uterine muscle is exceptionally irritable and liable to contract upon slight provocation.

3. *Overdistention of the Uterus.*—Like all hollow muscular organs, the uterus will tolerate distention up to a certain point; then it is stimulated to contract. This point is reached at about the tenth lunar month of pregnancy.

4. *Habit.*—A rather indefinite cause, meaning that, as for numberless generations, women have brought forth their children at about the fortieth week of gestation, the uterus is influenced by habit to begin its contractions at this time.

5. *Anaphylaxis theory*, supposedly due to a sudden transmission of fetal serum through the placenta into the maternal circulation, and by anaphylactic reaction causing the uterus to contract; a rather doubtful premise.

The symptoms of imminent or beginning labor are:

1. *Subsidence of the uterus*, occurring from one to two weeks before term. It is due to the contractions of the uterine and

abdominal muscles forcing the presenting part into the superior strait, and is a *premonitory*, not an actual, sign of labor.

2. *Characteristic labor pains*, which occur at intervals of ten to fifteen minutes. They are centered chiefly in the sacrum, radiating from there toward the anterior portion of the abdomen, last for about a minute, and during the pain the abdomen becomes hard and the uterine outline more prominent.

3. The *show* or discharge of the plug of mucus, slightly tinged with blood, which has occluded the cervical canal throughout pregnancy.

4. *Dilatation of the Cervix with Obliteration of its Length.*—This is the most valuable and important of the symptoms of beginning labor. The degree of dilatation, as labor advances, can be roughly estimated by the number of fingers that can be inserted in the canal, or by comparing the size of the canal with coins of different denominations (half-dollar, dollar, etc.).

The Stages of Labor.—Labor is divided into three stages, called first, second and third stages. The *first stage* is from the beginning of labor to the complete dilatation of the cervix; the *second stage* from the complete dilatation of the cervix to the birth of the child; the *third stage* from the birth of the child to the expulsion of the placenta and membranes.

The duration of the first stage varies considerably, depending upon the age of the patient, whether she is a primipara or multipara, the presentation of the child, etc. In primiparæ, the length of the first stage is ordinarily twelve hours. The length of the second stage is, on the average, from four to five hours in a primipara and about half that in a multipara.

The length of the third stage is about twenty to thirty minutes. The total length of labor in a vertex presentation in primiparæ is about eighteen hours, although twenty-four hours is not at all unusual. In breech presentations, on account of the inordinately long first stage, a labor of thirty-six to forty-eight hours is common.

THE MANAGEMENT OF NORMAL LABOR

On receiving a call to attend a case of labor, the physician should respond promptly. The **armamentarium** necessary is largely a matter of personal preference, but the following articles, with those provided by the patient herself, will be found sufficient for an ordinary case:

One obstetric bag (18 to 20 inches long).

Nail brush.

Eight ounces tincture green soap.

One bottle antiseptic tablets.

Two ounces liq. cresolis comp. (lysol).

One tube carbolized vaselin or K. Y. Jelly.

One obstetric forceps (Simpson).

One outlet forceps (Hale-Sawyer).

Hemostats and scissors.

Needles and needleholder (for immediate repair, if done).

Glass tubes (*not* envelopes) of number 1 and 3 chromic catgut.

Silkworm gut.

Hypodermic syringe and tablets.

Two pairs of rubber gloves.

Gown.

Ether and chloroform.

Pituitrin and aseptic ergot (for hypodermic use).

Two double tenacula.

One placental forceps.

One jar of uterine packing.

One tube of tape for tying cord.

The articles provided by the patient are:

One dozen towels, freshly laundered and preferably sterilized.

Six sheets.

Protective bed-pads, either nursery cloth (one yard square) or newspapers sewed up in cheesecloth. Preferably the former.

Rubber sheeting 1.5 × 2 yards.

Ten yards sterile gauze.
Two pounds absorbent cotton.
Abdominal and breast binders.
Flannel binders 6 × 18 inches for baby.
Talcum powder.
Four dozen safety pins.
Douche and bed-pan.
Fountain syringe.
Bath thermometer.
Rectal tube.
Soft rubber catheter, size number 17 F.
Two or 3 basins.

This list can be amplified considerably, according to personal preference, but can hardly, without sacrifice of efficiency, be reduced.

Examinations.—The examinations necessary to determine the condition of the patient are best carried out in the following order: The physician questions the patient concerning the pains; how long they last; the interval between them; their character and severity, etc. Having ascertained these points, the abdominal examination is next made. For this the patient lies flat on her back on the bed, her clothes rolled up above the level of the fundus, the bed clothes turned down to about the upper one-third of her thighs and a sheet thrown over her so that there is no exposure. Through this sheet the fetal body can be palpated, the fetal heart sounds heard, as well as if the abdomen were bare. The next examination is the vaginal examination.

Vaginal Examination.—For this the patient is best arranged lying upon her side, usually the one toward which the fetal back looks. Her buttocks are at the edge of the bed; her thighs well flexed on the abdomen and legs on the thighs. A sheet is then thrown over her, falling well over the edge of the bed. While the patient is being thus arranged by her nurse or other attendant, the physician can be cleaning his hands. A safe plan of hand cleansing is the following:

1. The hands should be smooth and the nails trimmed short.

2. They are scrubbed with a nail brush, green soap and hot water for ten minutes, *by the clock*, using hot running water.

3. The soap is rinsed off and the hands scrubbed for one minute in alcohol (95 per cent.).

4. A pair of rubber gloves, sterilized by boiling, is then put on, and the examination made.

The nurse lifts up the sheet, covering the patient, exposing the patient's genitalia. She then lifts up the upper buttock so that the vulvar orifice is exposed. The physician, with a

FIG. 29.—Patient prepared for the doctor's external examination. The sheet covering the abdomen is omitted, to show clearly the arrangement of the other coverings. (*De Lee.*)

pledget of cotton soaked in lysol solution, 1 dram to 2 pints (the use of bichlorid solutions in labor is dangerous to the baby's eyes, as some of the fluid is sure to remain in the vagina), wipes off the vulva in a direction toward the anus, and inserts his gloved finger directly by the sense of *sight*, into the vagina. The old practice of groping under the sheet for the vulvar orifice is extremely dirty and should never be done.

What is learned by vaginal examination:

1. The condition of the perineum (rigid or relaxed).

2. The condition of the vaginal walls.

3. The size of the pelvic cavity.
4. The condition of the cervix (hard or soft).

FIG. 30.—Patient prepared for the internal examination, lying on her back. (*De Lee.*)

5. The length and thickness of the cervix and the size of the external os.

6. The condition of the membranes (intact or ruptured).

7. The character, size and position of the presenting part.

Rectal examination has been suggested, and quite extensively employed, as a substitute for vaginal examination. The risk of infection is much less, and the method is to be preferred in cases where proper aseptic technic is impossible. The difficulties of diagnosis are easily overcome, and the method has much to commend it.

The Frequency of Examinations.—They should be limited to the smallest possible number. One during the first stage and

FIG. 31.—General arrangement of the delivery room, with patient arranged for vaginal examination, lying on her side. For the sake of clearness, the sheet covering her is omitted. (*De Lee.*)

one or two during the second stage are usually sufficient. The hand cleansing described above should be carefully carried out before each examination.

When it has been ascertained that the patient is in labor, the first thing to be done is to clean out the lower bowel by an enema. A cathartic should not be used, as it is unnecessary to empty anything but the lower bowel. The patient should take a full bath, if her personal hygiene is open to criticism, and should in any case put on clean underclothes and night dress.

During the early part of her labor she may be allowed to move about the room if she desires, and should be put to bed when the external os has reached the size of a silver dollar. From this time on she should not be allowed out of bed. The pubic hair should be shaved or clipped. Depilatory pastes (barium sulphid and starch) are not reliable and often very irritating.

Preparation of Room and Bed.—The room in which the labor takes place should not contain any unnecessary hanging. It

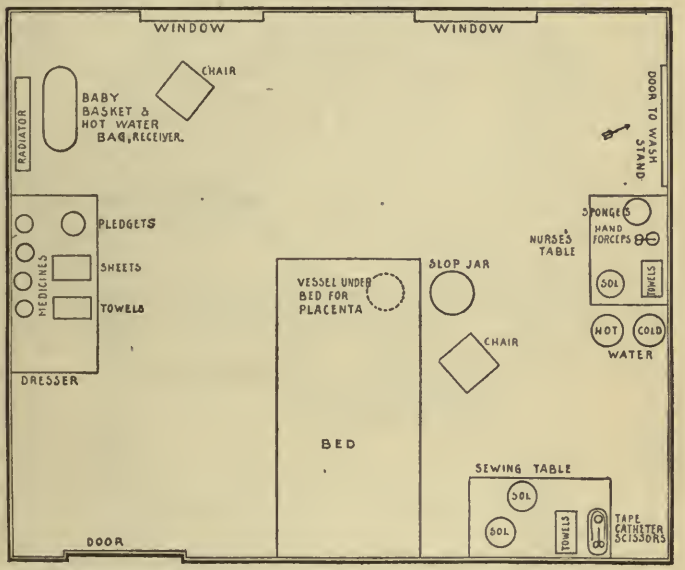


FIG. 32.—Diagram of room arranged for normal confinement. (*De Lee.*)

should be sunny and well ventilated, and ample provision should be made for artificial light, at night.

The bed should not be low. It is prepared for the labor by covering the central portion of the mattress with a piece of rubber sheeting about a yard wide and two yards long. An ordinary sheet next covers the whole mattress. On top of this is a second rubber sheet, of the same size as the first,

covered by a drawsheet slightly wider than the rubber. On top of this is the absorbent obstetric pad, best made of a piece of nursery cloth one yard square, which has been boiled and dried. It is secured to the mattress by safety pins.

At the head of the bed should be a table covered by a sheet. On this table are arranged (1) a basin of 1 dram to 2 pints lysol solution containing numbers of *large* pledgets of cotton; (2) ½ dozen clean towels; (3) a small basin of boracic acid solution, 10 grains to the ounce, containing some squares of

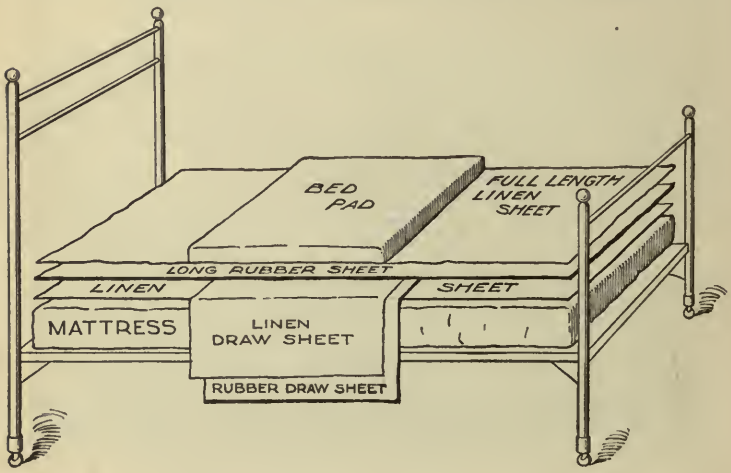


FIG. 33.—Arrangement of bed for a delivery.

lint; (4) carbolized vaselin; (5) a small basin containing the tape for the cord, soaking in lysol solution; (6) scissors for the cord, sterilized by boiling.

A chair is placed at the side of the bed, and a waste bucket, for waste material, at the foot of the chair.

Arrangements should be made for an abundant supply of boiled water, by boiling three pitchers in a clothes boiler full of water, filling the pitchers from this water and allowing them to cool. By mixing this water with a fresh supply of hot boiled water sterile water at any desired temperature can be

obtained. The bottled distilled water sold in drug stores answers perfectly for the cold water.

Management of First Stage

During the first stage of labor, very little activity on the part of the physician is required. The patient should be put to bed when the external os is the size of a dollar. It is not safe for the physician to be away from his patient, if the pains are coming as often as every five minutes.

Signs of danger to child in labor are a fetal heart beat sinking to 100 or below (except during a pain) and discharge of meconium into the liquor amnii (except in a breech presentation). The fetal heart rate should be counted at frequent intervals during labor. The cessation of fetal movements in labor is common, and usually without significance.

Nausea and vomiting in labor, especially in the first stage, is not uncommon. It is due usually to nervous reaction, and need cause no alarm. If the first stage has been unduly protracted and food has been withheld, it may be due to hunger. If so a light meal is beneficial.

Management of Second Stage

When the dilatation of the cervix is complete, the pains change in character. They are closer together, more severe, and during each pain the patient strains with all her might, bringing into play the abdominal muscles. In this stage the physician can materially aid his patient.

Anesthetics.—The need for an anesthetic is usually first seen during the second stage.

The methods employed are:

1. *Ether.*—This is not given continuously, but only for a few breaths at the beginning of each pain. When the pain begins, a few drops of ether are poured on a piece of gauze, placed over the patient's face, and she is told to breathe deeply. When the pain passes off, the gauze is removed, and replaced at the beginning of the next pain.

This has the merit of safety to recommend it.

2. *Chloroform.*—This is said to be safer during pregnancy and labor than at any other time. The method of administration is the same as ether, but smaller quantities are required.

3. *Scopolamin and Morphin, or Twilight Sleep.*—The patient is given an initial dose of $\frac{1}{6}$ grain morphin sulphate and $\frac{1}{50}$ grain scopolamin hypodermically. Forty-five minutes later a second hypodermic of $\frac{1}{200}$ grain scopolamin is given. Then further doses, as required, of scopolamin are given hypodermically, $\frac{1}{300}$ to $\frac{1}{150}$ grain, the test being the patient's memory of objects shown her. The room must be darkened and all unnecessary noise eliminated. "Twilight sleep" does not mean a painless labor, but simply a lack of memory of what has occurred. It has certain dangers. Inertia uteri; postpartum hemorrhage; frequent need of forceps delivery; asphyxia of the baby; and occasional severe mania.

Narcophen, the drug recommended by Krönig and Gauss, is a proprietary narcotin-morphin-meconate.

4. *Nitrous oxid and oxygen* is safe and often acts splendidly. There is a high percentage of failure, however. It is begun during the second stage, and given only for four to six breaths at the beginning of each pain. Two to three per cent. of oxygen is the usual amount, but many patients require pure nitrous oxid. There is danger of asphyxia to the baby if the mother becomes cyanosed. The method is also expensive, as considerable gas is needed, and it requires a trained anesthetist for its proper administration.

5. *Spinal anesthesia* is too evanescent and unreliable to be depended upon. Its field, if it has any at all in obstetrics, is just before the delivery of the head.

6. *Injection of the sacral hiatus* with $\frac{1}{400}$ novocain solution is of little value. The anesthesia secured is short, and at the best incomplete.

7. *Cannabis indica* has been used, with small success. One-fourth grain of the extract is the initial dose, but its use is too often followed by intense excitement.

Puller.—To aid the patient's abdominal muscles in their effort to expel the child, a puller is often employed. This is a sheet rolled on its long axis, to form a rope, which is securely tied to the foot of the bed, best at one corner and not in the middle. A pillow is placed against the foot board of the bed, for the patient to brace her feet against. She is given the end of the sheet and told to pull and strain during the pain. The use of the puller is discontinued when the perineum begins to bulge.

Rupture of Membranes.—The question of rupture of the membranes usually arises at this time. Unless they rupture spontaneously, a safe rule to follow is not to rupture them in a primipara unless they appear at the vulva, and in a multipara only when the dilatation of the cervix is complete. They are ruptured with a single blade of a pair of scissors or pinched through with a pair of placental forceps. It is often difficult, when wearing rubber gloves, to distinguish the membranes from the scalp. The scalp wrinkles during a pain, the membranes bulge; the scalp is rough, the membranes smooth; the scalp usually has hair, the membranes not.

It may be necessary to wait until the membranes bulge during a pain, to make sure whether they are ruptured.

Expressed Fecal Matter.—In the latter portion of the second stage, small masses of fecal matter are often extruded from the anus during a pain. They should be wiped away with a pledget of cotton soaked in lysol solution ʒi to Oii, wiping away from the vulva, and the pledget of cotton thrown in the waste bucket at the side of the bed.

Bulging of the Perineum.—When the head has descended to the pelvic floor and the rotation is complete, it is seen that during a pain the anus dilates slightly and the perineum bulges outward. At this time the physician should take his place at his patient's side, as her delivery is imminent.

Full bladder in labor is of common occurrence, and is easily recognized by the soft, cystic mass of the bladder under the lower abdominal wall. It is annoying to the patient and

attended with some risk of injury to the bladder in the late second stage. If the patient cannot void urine, she should be catheterized with a soft rubber catheter. Even if the head is far down, the catheter can be passed into the bladder if the forefinger of one hand is placed between the head and the symphysis pubis, and with this finger the catheter guided upward and forward into the bladder.

Position of Patient for Delivery.—The patient is best delivered lying on her side, her buttocks close to the edge of the bed, her thighs flexed upon her abdomen and her legs upon her thighs. The legs are separated by a pillow, rolled to form a cylinder, placed between the patient's legs *from the knees down*. The sheet covering her is looped up around her upper buttock and the opening thus made surrounded by sterile towels.

Leg-cramps in labor are frequent and most annoying. They affect most often the muscles of the calf, and next the thigh. By holding the leg up, at an angle of 30 degrees, fully extended, and pressing the foot forcibly upward, the cramp can quickly be relieved.

Distention of the Vulva.—As the head descends, the vulva gapes slightly during each pain. The child's scalp is visible. After the pain the head usually recedes somewhat, descending slightly further at the next pain.

Protection of the Perineum.—The perineum stretches until it is apparently as thin as paper and is obviously in danger of rupture. Some of the strain can be taken off it by retarding the advance of the head with one hand, and with the other, protected by a towel, pushing the head away from the perineum up under the symphysis. If the patient shows a tendency to strain at this time, the action of her abdominal muscles can be inhibited by having her breathe rapidly with her mouth open. The head can thus be gradually guided over the perineum, giving the maternal tissues time to stretch.

Episiotomy.—When the vulvar ring is overdistended by the head, and laceration seems imminent, a ragged tear can be avoided by incising the perineal body, so as to have a cut with

clean-cut edges. The incision can be made in one of three directions:

1. *Vertical* (straight toward the anus).—This is the easiest to repair and is the best under ordinary circumstances. If there is great disproportion between the head and outlet, or if the space between the posterior commissure of the vulva and the anus is unusually short, the vertical incision is to be avoided, because of the danger of tear of the sphincter ani.

FIG. 34.—Patient arranged for delivery on her side. The perineum is distended and the scalp visible between the labia. The rate of advance of the head can be controlled by pressure of the hands. (*American Text-Book of Obstetrics.*)

2. *Oblique.*—Extending from the posterior commissure of the vulva downward and outward. This is the line of choice if the cut has to be an extensive one, or if the space between the vulva and anus is short.

3. *Transverse.*—At right angles to the vulvar cleft. This is usually to be avoided as it gives no more room than the oblique, is very hard satisfactorily to repair, and leaves the perineum excessively tender for months afterward.

All episiotomy wounds are made with blunt pointed straight scissors, and as short as consistent with the desired result. They are repaired with interrupted stitches of over-chromicized (*never* plain) catgut, or silkworm-gut, just as any other external laceration.

After the head is born the first thing to do is to feel around the neck for the cord. If the cord is felt, it must be freed by hooking the finger under it and by pulling, making a loop which can be slipped over the child's head. If this is impossible, the cord can be cut between two hemostats.

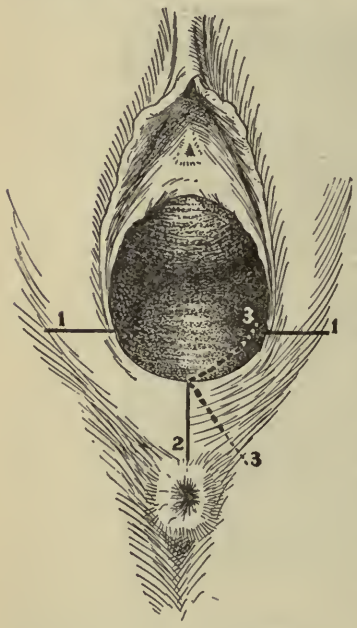


FIG. 35.—The three varieties of episiotomy. (*De Lee.*)

The child's face, directly after delivery is rather startlingly cyanosed, due to the fact that it is the only portion of the child free from pressure. This color does not indicate any haste in delivery, as the child is not in immediate danger of asphyxia. After a moment the head is seen to turn to one side, following the rotation of the shoulders internally. The head is then grasped between the physician's hands and gentle traction, preferably during a uterine contraction, is made, at first backward toward the anus, to engage the anterior shoulder under the symphysis, and then forward, so that the posterior shoulder glides out over the perineum. By slight backward traction the anterior shoulder is then delivered, and the rest of the child's body slips out without difficulty. Strong traction is harmful.

Should any difficulty be experienced in the delivery of the shoulders, traction should *never* be made by hooking the finger in the child's axilla. This nearly always results in a fractured humerus or injury to the brachial plexus and is mentioned only to be condemned. Slow, steady and gentle traction on the head, assisted by the patient's own voluntary straining efforts and uterine contraction is the only method to be used in delivery of the shoulders.

FIG. 36.—Delivery of the posterior shoulder. (*De Lee.*)

Nurse's Duties.—The nurse should, as soon as the head is born, wipe off the child's eyes with lint soaked in boracic acid solution. If there is any reason to suspect gonorrhea in the mother, the baby's eyes are flushed out with 10 per cent. argyrol solution, or the Credé method of instilling a few drops of 2 per cent. nitrate of silver in each eye is employed. The nurse then gives the mother a teaspoonful of fluid extract of ergot, or preferably a hypodermic of two ampules of aseptic ergot, given *deep* to avoid a persistent brown stain, and grasps the fundus through the anterior abdominal wall, and by *gently kneading*, sees that it is kept firmly contracted.

Baby after Birth.—When the baby is born, it usually gasps and begins to cry lustily. If it does not the physician should hold it upside down, clean out its mouth by hooking his little finger back of the pharynx, to remove the mucus which is probably blocking the trachea. Then by slapping its back and buttocks sharply, respiration will usually be started.

When it is breathing satisfactorily, it is placed upon its right side, with its head above the level of its mother's but-

FIG. 37.—Tying the umbilical cord. The cord is tied ½ inch from the skin margin. The material is narrow tape. (*De Lee.*)

tocks to favor the closure of the foramen ovale and to keep it out of the maternal discharges.

Tying and Cutting the Cord.—Unless there is some reason for hurry, the cord is not tied until pulsation in it has ceased. It is tied with a piece of sterile tape, tying first a surgeon's double knot at a point about two-finger's breadth from the child's abdomen. The free ends of the tape are brought around the cord and are tied in a single and then a slip knot at a point opposite the knot first tied. The cord is cut by bringing it up between the physician's fingers, to protect the child's fingers and toes from injury and cutting with scissors at

about one-half inch above the ligature. The placental end of the cord is allowed to drain, to reduce the bulk of the placenta, and facilitate its delivery. The baby is then wrapped in a blanket and placed out of the way, best in its own crib.

FIG. 38.—Cutting the umbilical cord. The cord is severed ¼ inch from the ligature. (*De Lee.*)

MANAGEMENT OF THE THIRD STAGE

Delivery of the Placenta.—The placenta is detached from the uterine wall by the contraction of its site, springing off from the uterine wall, as soon as it has been compressed to a mass about one-half its original size by the uterine contraction. This process takes as a rule from fifteen to twenty minutes, and should not be hurried. The time required is much shorter when pituitrin has been used. The placenta, after its separation is forced down into the lower dilated portion of the uterus, and often requires artificial assistance to secure it expulsion. The Crede method of expelling the placenta is the one usually employed, and consists in grasping the uterine body so that the fingers lie behind it, the fundus rests in the palm of the hand

and the thumb lies in front and slightly toward the right side. The uterus is stimulated to contract by gentle friction. As soon as it is felt to contract, it is tightly squeezed between the fingers and thumb and forced downward into the pelvis. This squeezes the placenta out of the vagina as a stone is squeezed out of a cherry. The placenta emerges like an

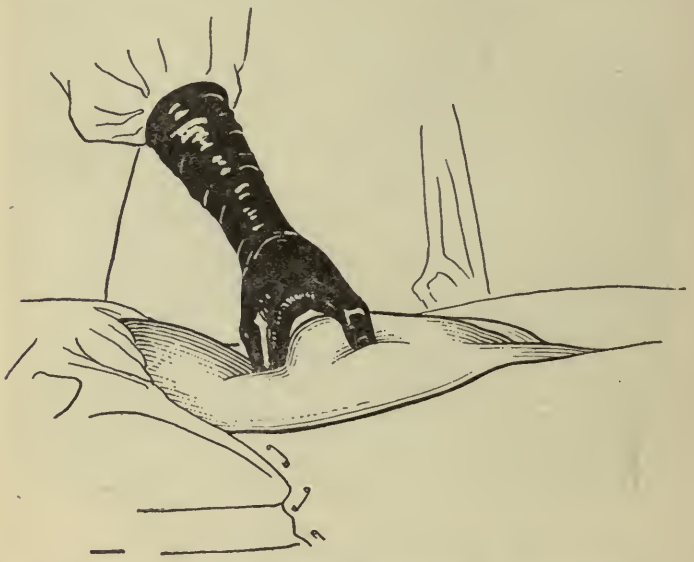


FIG. 39.—Credé's method of expression of placenta. The position of the thumb is important.

inverted umbrella, with the membranes trailing after it, and is caught in a basin pressed against the patient's buttocks, just below the vulvar orifice.

The **membranes,** which are caught and held by the firmly contracted uterus, are next extracted by grasping them with the thumb and forefinger, protected by gauze; pulling gently first toward the symphysis and then toward the perineum, at the same time stopping the kneading of the fundus, to allow the uterus to relax its grip. After a very

few moments the membranes slip out of the vagina. The placenta and membranes should next be examined to determine whether they are intact, or whether pieces of either have been left in the uterus. If any part of the placenta is missing it should be extracted from the uterus. The hand or instruments should never be inserted into the uterus to recover part of the membranes unless more than half of them be missing. Missing parts of the membranes are ordinarily spontaneously extruded from the uterus; missing pieces of placenta are usually adherent to the uterine wall and will cause long continued and sometimes serious bleeding unless extracted.

Care of the Patient Directly after Delivery.—As soon as the placenta and membranes have been extracted, the patient may be examined to determine if any lacerations exist. Any repair needed can be done at this time, if so desired. This plan is not recommended, for reasons given in the chapter on injuries of the birth-canal. If the repair is done, the suture material should be either silkworm gut or over-chromicized number 3 catgut. The plain or ordinary catgut is absorbed much too soon. It is usually better, however, to defer this examination until after twenty-four hours and it will be described under the care of the puerperium. Unless the patient is to be examined, the care then devolves upon the nurse. She slips the soiled pads, sheets and rubber protective sheeting off the bed, so that the patient will lie upon the clean sheets, already spread under the temporary labor bed. The genitalia are washed off with lysol solution, and the abdominal pad, binder and vulvar pad are adjusted.

The *abdominal pad* is intended to (1) fill the space in the abdomen left vacant by the contracted uterus and (2) to act as a mild irritant to the uterus and thus maintain its contraction. It is best made of one or two folded towels, and is placed so that its lower edge is just above the fundus uteri. It must not be lower than this, to avoid exerting pressure directly upon the anterior uterine wall.

The *abdominal binder* is of unbleached muslin; long enough

to reach about once and a quarter around the patient's body, and wide enough to extend from the floating ribs to the trochanters. It is put on snugly, and fastened by safety pins down the center and tightened by darts at each side. The incorporation of a wide strap to hold the vulvar pad in place—like a T-bandage, is of great use in preventing the binder from riding up.

The *vulvar pads* are made of a sausage-shaped envelope of gauze stuffed with cotton. The day's supply is made up in the morning by the nurse who should carefully clean her hands, and they should be changed about six times in the twenty-four hours.

Postpartum Chill.—Very often, shortly after the delivery of the placenta, the patient complains bitterly of cold, and shakes violently. It looks alarming, but is of no moment and of short duration. It is a vasomotor disturbance, said to be due to the sudden diminution in heat by cessation of the violent muscular effort in labor, and to the loss of heat by perspiration. It requires no treatment other than warm covering, hot-water bags and an assurance of safety to the patient and particularly to her family.

The Infant After Delivery.—After the mother has been attended to the nurse turns her attention to the baby. To remove the vernix caseosa with which it is covered, it should be greased with olive oil (lard is often used and answers the purpose very well) and carefully washed with a good soap, water at a temperature of 90° F. (tested by a bath thermometer and not by guess). It should be washed in the nurse's lap and not put into a tub until the end of the first week to avoid wetting the cord and its dressing.

The cord is then retied and dressed. The nurse unties the slip-knot in the ligature of the cord, pulls the ligature tight and ties it securely in a square knot. The cord is dressed by taking a square piece of gauze and cutting it down the middle for one-half its length. The cord is then brought up through the slit in the gauze and covered by folding one-half of the

gauze over it. The flannel abdominal band is next wrapped around the child's abdomen, and is secured by basting over the ends with needle and thread. The child is dressed and put in its own crib and should not be in bed with its mother.

The following routine orders for the care of a normal case, may be of use to the student.

Routine After-care of Obstetric Cases

1. Apply abdominal pad *above* uterus, and hold by abdominal binder, tightly applied. Binder should be wide enough to extend from lower ribs to the upper one-third of thighs. Keep binder well tightened, and pin the pad to the binder.

2. After forty-eight hours apply Murphy breast binder as well, nipples being *always* covered with sterile gauze.

3. If nipples are sore, use witch-hazel p. r. n.

4. Catheterize every 12 hours, if necessary.

5. After 48 hours give ½ bottle *flat* citrate of magnesia (without the gas) and the other half six hours later.

6. If nipples are fissured, use Infantibus or Phenix rubber nipple shield, and apply after nursing equal parts of castor oil and subnitrate of bismuth. This should be washed off with boric acid before each nursing.

7. Regularly, before and after nursing, wash nipples with boric acid solution (10 grains to the ounce) and after nursing dry and rub in a few drops of sterile sweet oil. Use pledgets of sterile cotton.

8. **Diet.**—Soft for first two days; light for next three days; full diet after fifth day. Give no strawberries or raw tomatoes.

9. Patient on back for first twelve hours, then may turn on side.

10. After repair (seventh day) massage breasts three times during afternoon, put baby on condensed milk 1 dram, boiled water 12 drams every 3 hours, and back on breast at midnight feeding.

11. As few visitors as possible.

12. If breasts need massage, use oil on fingers, and *be gentle*.

13. When breasts are painful from excess of milk, massage gently, and keep breast binder firm, with ice-bags on outside of binder, if very painful.

Routine Care of Baby

1. Oil with sweet oil or lard.

2. Give first bath after mother is attended to.

3. Dress cord with sterile gauze, and do not disturb dressing till cord falls off, unless it comes away very easily.

4. Use boric acid or borated talcum as a dusting powder. If after cord is off, the stump is not dry, use salicylic acid 1, starch 6, as a powder.

5. Wash eyes with boric acid (10 grains to ounce) daily.

6. Keep in crib or basket, and *not* in bed with its mother.

7. Put to breast every 4 hours for first forty-eight hours. If it seems hungry, give condensed milk 1 dram, boiled water 12 drams *after* it has tried to nurse.

8. When milk comes in, nurse every 3 hours from 7 A.M. to 10 P.M. Then at 2 A.M. again. *This must be regular, if asleep, wake it up.*

9. If jaundiced, give calomel gr. $\frac{1}{20}$ every $\frac{1}{2}$ hour for ten doses, followed in two hours by $\frac{1}{2}$ dram each of castor oil and sweet oil.

10. After each nursing, wash mouth with piece of gauze or lint, with 10 grains to the ounce boric acid solution.

11. Bathe once daily. Water 90° F. If buttocks chafed, use sweet oil rubs, and *no water.*

12. If it nurses too fast, give $\frac{1}{2}$ ounce cool water just before each nursing.

13. *Do not pick up, or nurse irregularly if it cries.* It should be left alone in its crib as much as possible.

14. If urine colored red, or red stain on diaper, give $\frac{1}{2}$ ounce of water between feedings.

15. Weigh three times a week for the first month, then on Wednesdays and Sundays, and keep record of the weight.

16. Feeding intervals vary somewhat, with different babies. Whatever interval is adopted, *be regular.*

The physician should wait in the house for at least an hour after the delivery, on account of the possibility of post-partum hemorrhage.

CHAPTER V

NORMAL PUERPERIUM

Puerperium.—The puerperium is the name given to the period of convalescence from child-birth, during which the different organs and systems of the woman's body are restored to their normal state. The duration of the puerperium is normally six to eight weeks.

Involution of the uterus is one of the most striking changes that take place during this period. It is the process by which the uterus is restored to its normal size. The precise manner in which this change is effected is still a matter of dispute, but it is generally believed to be a fatty degeneration and absorption of the redundant portion of the muscle fibers of the uterus (the portion added during pregnancy), and not the total destruction of the old fibers with the formation of new ones.

Involution of the Endometrium.—The regeneration of the endometrium proceeds from the glandular layer of the deciduæ, and is due to a process of active growth and development. Both the glands and the interglandular stroma share in this development. It is complete at about the eighth to tenth week after confinement.

The *rate of involution* of the uterus is judged by the position that the fundus uteri occupies on successive days after delivery. Directly after delivery it is just below the umbilicus; twenty-four hours later it has risen to a finger's breadth above the umbilicus. From this point the uterus steadily decreases in size until the fundus disappears behind the symphysis on the tenth to fourteenth day. This disappearance on the tenth day or shortly thereafter has given rise to the erroneous idea

that the ninth day marks a critical period in the woman's convalescence.

The **lochia** is the discharge from the uterus after delivery and during the puerperium. It is of three kinds. (1) The *lochia rubra*, lasting from four to five days and consisting chiefly of blood; (2) the *lochia serosa* lasting one to two days

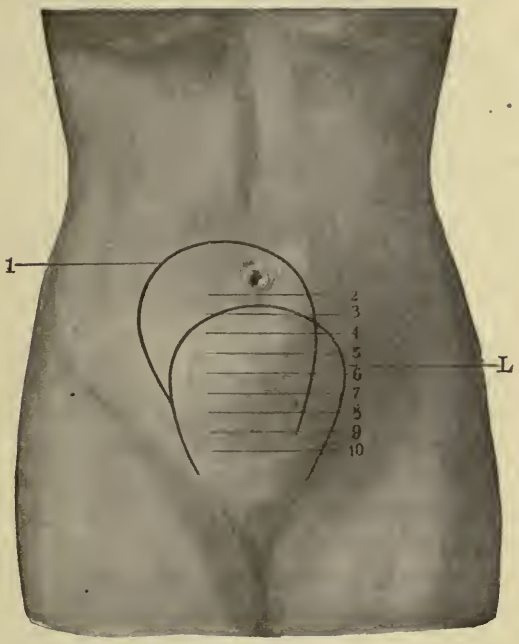


FIG. 40.—Height of uterus postpartum, the bladder empty: L, After labor; 1, first day; 2, second day, etc. (*De Lee.*)

and consisting of serous oozing from the granulation tissue in the parturient tract; (3) the *lochia alba* lasting another seven to ten days, and consisting of a purulent secretion from these granulating surfaces, and the regenerating endometrium. The total quantity of the lochia has been estimated at three and one-quarter pounds, but it is usually measured by the number

of vulvar pads required. These pads should be changed, during the first week, six times per twenty-four hours.

Changes in Breasts.—The breast is a compound racemose gland; the milk-ducts from the different lobules are gradually collected into lacteal ducts, some fifteen or twenty in number, which open at the nipple, each by its separate opening. The epithelium of the ducts is continuous with that of the skin over them.

The lacteal ducts are lined with squamous epithelium; the small ducts in the lobules with columnar epithelium.

The fluid secreted by the breasts during pregnancy and for the first forty-eight hours after labor is thin, opalescent and possesses slight nutritive and markedly laxative qualities due to its high proteid content. At the end of forty-eight hours the breasts rapidly enlarge, are engorged, tender and painful to pressure. On slight pressure the milk will run out of the nipples.

Characteristics of Human Milk.—It is white, opaque, has a specific gravity of 1025, a sweetish taste, and contains proteins 1.75 per cent., fat 4 per cent., sugar of milk 7 per cent., ash 0.5 per cent., and water 85 per cent. Its reaction is alkaline and it ordinarily contains no micro-organisms.

Quantity of Milk.—The quantity of milk secreted by the breasts for the first week is about fourteen fluid ounces in twenty-four hours. After the fourth week it is about two pints in twenty-four hours. It increases gradually up to the sixth or seventh month, when the quantity is three pints in twenty-four hours. After the eighth month the quantity gradually decreases. In many women, the quantity of milk is often very much less than this, it being common for them to have to discontinue nursing their infants as early as the second month.

MANAGEMENT OF THE PUERPERIUM

Position of Patient in Bed.—For the first six hours the patient should lie flat on her back, without a pillow, to lessen

the danger of cerebral anemia. For the first forty-eight hours she should remain flat on her back if possible. Thereafter she may turn on either side. During the second week, it is wise to have her lie flat on her abdomen for two periods of one hour each, daily, to favor forward position of the uterus.

At the end of the second week, or possibly a few days sooner, if the fundus uteri has reached the symphysis, she is shifted from her bed to a lounge or easy chair, sitting up as long at a time as she can without fatigue. During the fourth week she is walking about the room and the floor on which the room is situated, but does not go downstairs.

At the end of the fourth week she goes downstairs for the first time.

Temperature and Pulse.—The temperature should be taken at least four times a day. The recently delivered woman is subject to variations of temperature for very slight cause, and a temperature of less than 100° F. can ordinarily be disregarded.

The pulse is slow and full, usually 60 to 70 beats a minute.

After-pains.—The uterus, having been firmly contracted under the influence of ergot and external stimulation, relaxes somewhat a few hours after labor. This relaxation allows a little blood to ooze out of the vessels at the placental site. The blood collects until it forms a clot large enough to stimulate the uterus to contract again, to secure its expulsion. This contraction is painful and to it the name *after-pain* is given. After-pains are more common in multiparæ than in primiparæ. The common statement of the patient that the pains are worse than labor pains is an exaggeration.

The *diagnosis* is easily made by noticing the cramp-like paroxysmal pain, often followed by the expulsion of the clot, and by noting that during the pain the uterus is firmly contracted.

The *treatment* is the administration of a teaspoonful of a mixture containing equal parts of fluidextract of ergot and paregoric, every three hours for three or four doses. If the pains are very severe, they may be controlled by ergot by the

mouth and morphin gr. $\frac{1}{6}$ hypodermically. This is rarely necessary.

Diet.—For the first two days the patient needs comparatively little food, and her diet is best limited to liquids such as milk, broths, clear soups, etc., with the addition of toast and some kind of cereal; one cup of tea a day may be permitted if desired. During the third and fourth days, the milk secretion has begun and the diet should be increased by the addition of milk toast, eggs (poached, soft boiled or scrambled) stewed oysters and similar articles. During the fifth and sixth days the diet is still further increased by adding white meat of chicken, tenderloin of beef, mutton chops, mashed potatoes and the more easily digested vegetables. After the sixth day the patient is allowed an ordinary light diet of three meals a day, meat at one of them, and should be advised to drink at least four glasses of milk a day, in addition to her ordinary diet.

Visitors.—The visitors to the lying-in rooms should be, if possible, restricted to the immediate family; all others should be excluded, for the first week at least.

Care of Genitalia.—The genitalia should be washed off with lysol (℥i to Oii) solution when the vulvar pads are changed—four to six times a day.

Abdominal Binder and Vulvar Pads.—The nurse should see that the abdominal binder fits smoothly and snugly. It must be tightened frequently.

The *vulvar pads* must be changed four to six times a day. A necessary but unpleasant part of the physician's daily visit is the routine inspection of the vulvar pads which the nurse will have saved for him. They should be examined by sight and smell, as frequently the first indication of infection is the brown color and foul smell of the lochia. The lochia rubra have normally the odor of fresh blood or raw meat.

Urination.—The recently delivered woman frequently has retention of urine for a considerable time (24 to 48 hours) after her labor. Before labor, the bladder is pressed upon by the

uterus, and expand in one direction only—upward. After labor this pressure is relieved, and it expands in all directions and holds a considerable quantity of urine before the patient feels any desire to urinate. This is the commonest cause of retention of urine after labor. Another cause is the *edema* of the anterior vaginal wall and urethra, caused by the pressure of the child's head in labor, forming a mechanical obstruction.

The *treatment* is to wait for twenty-four or even thirty-six hours after labor if necessary before resorting to the use of the catheter. If catheterization is once begun, it should be done every twelve hours until the patient is able to void her own urine.

The *urine* after labor is increased in amount, but all its solids except the chlorides are decreased.

Bowels.—A parturient woman is usually constipated and requires the routine use of laxatives. Forty-eight hours after delivery, an active cathartic should be given (castor oil one ounce, or magnesium citrate ½ bottle or 6 ounces, or magnesium sulphate ½ ounce), followed, if necessary, by an enema. As the nursing mother cannot take fluid charged with carbonic acid gas, the magnesium citrate should be given *flat*.

A daily movement of the bowels should be secured by the use of some suitable laxative such as cascara gtt. xxx in syrup of figs 1 dram, at 9 P.M., followed the next morning by an enema, if necessary.

Profuse sweating after delivery is not uncommon. It lasts as a rule throughout the first week and does not give cause for alarm. The watery elements of the body are all increased during pregnancy, and this sweating is one of nature's methods of correcting the hydremia of pregnancy. It requires no treatment.

Management of the Breasts.—The breasts require little attention until the milk secretion begins. This appears at the end of forty-eight hours, when the milk usually comes in rapidly, and the breasts become markedly engorged. They

should be emptied by encouraging the child to nurse regularly every three hours. The excess of milk, if the child cannot empty the breast, must be drained off with the breast-pump and massage, and the breasts supported by a breast binder. The Murphy binder is the best. The *nipples* must be carefully washed off after each nursing with boracic acid solution, and a few drops of sweet oil rubbed in the nipple and areola with a piece of absorbent cotton. The nurse and

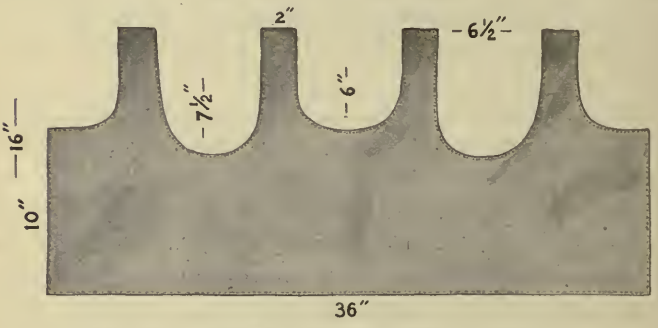


FIG. 41.—The Murphy breast binder. (*De Lee.*)

patient should both be cautioned against handling the nipples with their fingers. The nipples, under the binder, are kept covered with sterile gauze.

Visits.—The physician should see his patient again within twelve hours after her labor. He should visit her once a day for the first two weeks, every other day during the third and once or twice during the fourth week. She should be instructed to report at the office at the end of six weeks for her final examination.

Return of menses after delivery is not subject to a hard and fast rule. Usually during the puerperium and lactation there is a four- to six-month period in which there is no menstruation. During this period the uterus is super-involuted (lactation atrophy) and this fact is one of nature's efforts to limit too rapid a repetition of pregnancy. Menstruation

may return, however, at any date and is liable to be profuse and prolonged for the first few periods. Its return, contrary to popular superstition, has no disastrous effect upon the mother's milk and is not a sign for weaning the child. Should the mother, while nursing, become pregnant again, the child should be weaned, because the nursing is liable to cause the mother to miscarry, and the child is certain to be undernourished, as pregnancy seriously affects the quality of the milk.

Examinations necessary in the puerperium are three in number. The first is made 4 or 5 days after labor, and is for the diagnosis of lacerations. This examination should be carried out with the patient across the bed with her feet on two chairs, or better in the lithotomy position on a table. Lacerations cannot be satisfactorily inspected and many severe ones will be overlooked if the patient, during the examination, lies in her ordinary position in bed. The cervix should be inspected through a bivalve speculum. The labia should be separated with pledgets of cotton and any tears in the vagina can be easily seen and their character and extent noted. More detailed instructions for the conduct of these examinations will be found in the chapter on lacerations of the birth-canal. The order of examination should be:

1. Inspection of the cervix through a bivalve speculum.
2. Palpation of the muscle of urogenital trigonum (see injuries of birth-canal).
3. Palpation of levator ani, deep transversus and superficial transversus perinei.
4. Palpation of sphincter ani.

The best time to repair all injuries of the birth-canal is one week after delivery. Directly after labor the bruising of the tissues makes accurate diagnosis impossible and satisfactory repair difficult. The delayed repair does not add to the length of her convalescence.

Should the patient have fever, the repair is postponed until the temperature is normal for five to seven days.

The detailed technic of diagnosis and repair is given in the chapter on injuries of the birth-canal.

The *second examination* is made during the third week, to determine the *position of the uterus*. If the uterus is found retroverted, it is replaced and the patient instructed to assume the knee-chest position twice a day for as long at a time as she can without fatigue up to half an hour. She should be told to separate the labia slightly with her fingers when in the knee-chest position or insert the sterile nozzle of a fountain syringe, to allow air to balloon out the vagina.

The *knee-chest position* consists in the patient kneeling upon the edge of the bed, keeping the thighs perpendicular and the pelvis as high as possible. She then leans forward, turning her head to one side, until her chest touches the bed. Some practice is required before it can be maintained properly.

The *third or final examination* is made at the end of the sixth or eighth week. It consists of the careful investigation of the following:

1. The *inspection of the vulvar orifice*, as the patient is in the lithotomy position, for gaping.

2. The *testing of the levator ani muscle*, by inserting the index finger up to the second joint, and making pressure downward and outward toward the tuberosity of the ischium. If the muscle is torn, the finger sinks in a cleft. The finger should then be swept from one ramus of the pubis to the other, to see if the muscle forms an unbroken horseshoe curve.

The testing of the sphincter ani and remaining muscles.

3. The *condition of the cervix by digital examination*, which is unreliable and must be supplemented by examination through a speculum.

4. The *size and position of the uterus* by placing two fingers of the examining hand *in front* of the cervix and by making pressure with the other hand on the abdomen just above the symphysis, the uterine body, if in good position, can be grasped between the two hands.

5. The *examination of the tubes and ovaries* by using hand

corresponding to the side examined. Placing the fingers in the lateral vaginal vaults, and with the other hand pressing downward and inward above Poupart's ligament on either side the tubes and ovaries can usually be felt. This requires some dexterity, and the beginner must usually content himself with noting whether the vaginal vaults are soft and yielding or hard and resistant. If soft, there is probably no inflammatory reaction; if hard, inflammation probably exists.

6. The *examination of the cervix* through a bivalve speculum.

7. The *examination of the abdominal wall* for diastasis of the rectus muscle. Placing the hand so that the ulnar side makes pressure in the middle line of the abdomen, the patient is asked to strain as if about to sit up. If diastasis exists, the separated muscles can easily be felt.

8. *The Examination of the Kidneys for Position.*—The patient is examined in a semirecumbent position and requested to relax her abdominal muscles as much as possible. One hand is then placed in the patient's lumbar region, just below the last rib. The other hand makes pressure just below the floating ribs on the abdominal surface, and if the kidney is low, it can be grasped between the hands. It is necessary for the abdominal hand to palpate as low as the pelvic brim, as the kidney sometimes descends this far.

9. The *testing of the coccyx* for fracture. The patient is placed in the Sims' position. The forefinger of one hand, protected by a finger-cot, is inserted in the rectum, and the coccyx grasped between this finger and the thumb in the anal fold. The coccyx possesses a certain normal mobility anteroposteriorly. If it can be moved laterally, if the movement gives the patient pain and if a sharp angle can be made by separating the upper and lower portions of the bone, it is injured. When injured it is most commonly through the joint between the first and second pieces, and rarely through the bone itself.

CHAPTER VI

PHYSIOLOGY AND MANAGEMENT OF THE NEW-BORN INFANT

PHYSIOLOGY OF THE NEW-BORN INFANT

Weight.—This is normally 7 to 7⅓ pounds at birth. Variations from this rule are common. Weights of nine and ten pounds are not infrequent; anything over twelve pounds being very rare. A baby usually loses about one-half pound during the first week, it regains this during the second week, and should then gain in weight at the rate of one and one-half pounds a month until about the fourth month, and one pound a month thereafter.

Pulse.—The pulse of a new-born baby is usually 140 to 160 to the minute.

Respirations are at a rate of forty-four a minute, sinking after about the fourth month to thirty-five. Respiration is begun by (1) shock of the colder air on the child's skin; (2) accumulation of CO_2 in the blood, causing it to gasp.

Temperature.—The temperature directly after birth is slightly elevated. By the next day it has sunk to normal, and then runs an irregular course, being greatly influenced by very slight causes.

Urine.—The urine is albuminous, of low specific gravity and deficient in coloring matter. It does not stain the diapers and is voided in small quantities and frequently. The total quantity of urine increases from an average of 18 mils on the first day to 220 mils on the eighth day. Bottle-fed babies pass 50 to 75 per cent. more than breast-fed.

The small amount of moisture on the diaper and the lack of staining often cause a report that the child has passed no urine.

Similarly, "bloody" urine is due to uric acid and is a signal for more water.

Bowels.—For the first two days, the bowel movements are dark green in color, consisting of meconium; after the second day when the child begins to receive its nourishment, they gradually become canary yellow, liquid and reasonably free from curds. They move three to four times a day.

Stomach.—The stomach is placed high up on the left side. Its long axis is vertical, which explains the frequent regurgitation of milk. Its *capacity* is about one ounce at birth, increases an ounce a month up to the sixth month, and thereafter somewhat more slowly.

The **eyes** are nearly always a sort of slate blue in color. The eyesight is hypermetropic.

The **blood** contains six to seven million red cells to the cubic millimeter, the red cells are more spherical, and for the first ten days, often nucleated. White cells are more numerous than in the adult (up to 23,000), and the hemoglobin percentage is 120 (compared to 93 per cent. in the mother's blood).

MANAGEMENT OF THE NEW-BORN CHILD

Bath.—Its first bath is given shortly after labor, the water being at a temperature of 90° F. (as tested by a thermometer). The child is greased with olive oil or lard, to remove the vernix caseosa, and is washed in the nurse's lap. The infant is bathed daily, about the middle of the day, the water at 90° F. and is not put into the tub until the end of the first week.

Cord.—The cord is dressed with sterile gauze, and an abdominal binder. There is no choice in the different materials recommended for the dressing of the cord, as long as the material is sterile. The same is true of dusting powders, a satisfactory one is one part of salicylic acid to six of starch. The cord undergoes mummification and drops off about the fifth day. The stump retracts within the umbilical ring, and heals in a very few days. If umbilical discharge persists, cleanliness and a dusting powder are all that are required.

Clothing.—All the skirts and dresses worn by the baby should be made on waists, to hang from the shoulders, and nothing should depend upon being fastened around the child's waist for its support, except the flannel abdominal band.

Feeding.—For the first two days, the child is put to the breast every four hours. When it is thirty-six hours old it will usually awaken to the fact that it has an appetite, and will cry vigorously from hunger. The mother has no milk until after forty-eight hours, so the interval should be bridged by making a mixture of one part of condensed milk and twelve parts of boiled water, and giving the baby an ounce or so of this every three or four hours. Its use should be discontinued when the mother's milk begins. After the second day, the nursing intervals should be every three hours during the day from 7 A.M. to 10 P.M. and once during the night at 2 A.M. These intervals should be closely adhered to, if possible. The importance of training the baby to regular habits cannot be overestimated. Too frequent nursing increases the proportion of solid elements in the milk, and makes it difficult to digest. Too infrequent nursing increases the watery elements, and deprives the milk of its nutritive qualities. The length of time babies should nurse is, on the average, ten to twenty minutes.

Diapers.—The diapers should be changed often, as the child urinates frequently and if the wet diaper is allowed to remain in place, severe chafing will result. The baby's buttocks must be washed off and dried, and also dusted with a good dusting powder (borated talcum) whenever it is found that the diaper is wet. This is most conveniently done after the nursing. If chafing appears, soap and water cleansing should be stopped, and the child cleansed with sterile oil.

Care of the Child's Mouth.—The baby's mouth should be carefully cleansed after nursing with small squares of lint wet with a 10 gr. to the ounce boracic acid solution, or with sterile water to prevent the occurrence of stomatitis and thrush.

Resting place should be its own basket or crib. On account of the danger of overlying, it should not be in bed with its mother.

Airing.—The baby may be taken out after the second month in summer, and the third month in winter, in fine weather, for a short time.

Care of Premature Infants.—The difficulties to be overcome are those of low temperature and underdeveloped digestive apparatus.

The following procedures overcome them, in so far as it is possible.

1. Child is not dressed but wrapped in gauze and cotton or wool. The diaper is placed under its buttocks, and changed when required.

2. The child is placed in a deep basket, well filled with pillows and blankets, and lined with hot water bottles. If steam heat is available, the basket should be pushed close to the radiator. A temperature of 90° should be maintained as constantly as possible.

3. The child is fed by drawing the mother's milk with a breast-pump, diluting it one-half with sterile water, and ½ ounce of this mixture given every hour, with a medicine dropper. Gavage through a tube is not practical.

4. The child is rubbed once daily with warm sweet oil and is not otherwise washed.

Prognosis.—At six months, 10 per cent. are saved; at six and one-half months, 20 per cent.; at seven months, 40 per cent.; at seven and one-half months, 75 per cent.; at eight months and thereafter 90 to 95 per cent.

Artificial Feeding of Infants.—There are two methods available: (1) a wet-nurse and (2) modification of cow's milk.

Wet-nurse.—The qualifications are (1) She should have a child of nearly the same age as the one to be nursed; (2) she should have neither syphilis nor tuberculosis; (3) her milk should be of good quality, as is best evidenced by the appearance of her own child; (4) she should be from respectable

surroundings. In this country it is often difficult to secure wet-nurses, even though bureaus to supply them exist in many of the large cities.

Modification of Cow's Milk

ANALYSIS

Cow's Milk	*Human Milk*
1. White.	1. Yellowish.
2. Acid.	2. Alkaline usually.
3. Septic.	3. Practically sterile.
4. Curds heavy.	4. Curds light and flocculent.
5. Fat 4 per cent.	5. Fat 4 per cent.
Sugar 6 per cent.	Sugar 7 per cent.
Casein 3.5 to 4 per cent.	Casein 1.75 per cent.

The chief difference is thus seen to be in the casein contents. Goat's milk is much more like human milk, but in this country is difficult to procure.

The capacity of the child's stomach is about one ounce at birth and increases roughly one ounce for each month of age; the feeding interval is at first every three hours and is lengthened, as the child grows, to three and one-half and four hours. The total amount of food varies from ten ounces in twenty-four hours at birth to forty ounces by the end of the first year.

Each child is an individual problem; hence no short synopsis of feeding can be given. For details of feeding, the student is referred to works on diseases of children, in all of which the subject is fully discussed.

It is not desirable, in a manual on obstetrics, to enter into too great details of artificial feeding in infants. The problem is often presented however, during the puerperium and the following method is so simple and has given the author such satisfaction that he includes it here. The method is devised by Dr. Charles W. West, of Philadelphia, and possesses all necessary attributes of accuracy, simplicity and flexibility.

The percentage of fat, proteid, sugar, and the total quantity

required are first decided upon. Then the necessary quantity of milk, water and sugar are determined by the following formula. The formula is based upon the use of a 4 per cent. milk.

Formula.

$\frac{\text{Proteid}}{\text{fat}} \times 32$ = number of ounces of top milk dipped out,

$\frac{\text{Proteid}}{4} \times$ quantity = amount of top milk withdrawn to be used,

$\frac{\text{Quantity}}{100} \times$ (Sugar-proteid) = number ounces of dextrimaltose or milk-sugar,

Quantity-number ounces milk used = number ounces of barley-water.

EXAMPLE

It is desired to make up 24 ounces of a mixture containing 1 per cent. proteid; 6 per cent. sugar; 3 per cent. fat.

$\frac{1}{3} \times 32 = 10\frac{2}{3}$ or 11 (practically) ounces of top milk to be withdrawn,

$\frac{1}{4} \times 24 = 6$ ounces of this top milk to be used,

$\frac{24}{100} \times 5 = \frac{120}{100} = 1\frac{1}{5}$ $(1\frac{1}{4})$ ounces of milk-sugar,

$24-6 = 18$ ounces of barley water.

DIRECTIONS FOR THIS MIXTURE, GIVEN TO THE MOTHER OR NURSE

From a quart jar (*not* shaken up) of 4 per cent. milk, dip off, with a Chapin dipper, the top 11 ounces, and pour into a clean vessel. Of this 11 ounces, 6 ounces are again dipped off, and to this added $1\frac{1}{4}$ ounces of milk sugar and 18 ounces of barley water.

It is always easiest to work out the quantities in multiples of

12 ounces. The above example gives 10 bottles of 2 ounces each with 2 extra for possible breakage.

Pasteurization of Milk.—An easy method is the following:

1. Prepare the number of bottles required for twenty-four hours, in the morning.

2. Stopper with cotton and place in a vessel deep enough to contain them. The bottles should be warmed to prevent cracking, and a rack to hold them is very convenient.

3. Pour on actively boiling water up to the level of the milk.

4. Put on cover and stand aside for thirty minutes.

5. Keep the bottles on ice until used, and warm each one just before giving to the baby.

This gives the milk a temperature of 170° F. for twenty minutes. The bottles are filled to the brim with cold water just after using, and are scalded out before being refilled the next day. The nipples should be bought as blanks, scalded and kept in a covered quart Mason jar of boric acid solution. The holes are made with a hot needle; the proper size hole yielding two or three drops a second.

CHAPTER VII

THE MECHANISM OF LABOR

Presentation.—By presentation is meant the part of the fetus which presents at the pelvic inlet.

Position.—The position of the presenting part describes the relation that the most prominent portion of the presenting part bears to the mother's acetabula or sacro-iliac junctions. The methods of naming presentations are numerous. The most widely used method is the following:

Each presentation is named from its most prominent portion: The *vertex* is named from the *occiput;* the *face* and *brow* from the *chin;* the *breech* from the *sacrum.*

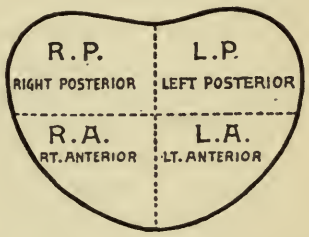


FIG. 42.—The four quadrants of the pelvic inlet. Used in naming the different presentations. (*De Lee.*)

There are four positions of each presentation. If, to use the vertex as a model, the occiput points toward the mother's left acetabulum, the position is left occipito-anterior, or L. O. A., as it is ordinarily abbreviated. If it points toward the right acetabulum, it is a right occipito-anterior, or R. O. A. If toward the right or left sacro-iliac junction, it is right or left occipitoposterior; R. O. P. or L. O. P. In a face presentation we then have right or left *mento-anterior* or *posterior;* in a breech presentation, right or left *sacro-anterior* or *posterior.* The method applies to all presentations.

Most Frequent Presentation.—The position of the child in utero is longitudinal in 99.5 per cent. of all cases. The *head* is the most common extremity to present. It is the heaviest

portion of the child and naturally tends to gravitate downward, and supposedly aided by the fact that the child voluntarily assumes the position, to give its extremities more room in the upper portion of the uterus. The commonest portion of the head to present is the *vertex*. The vertex is roughly that portion of the child's head between the anterior and posterior fontanels. From the anterior fontanel to the root of the nose is the *sinciput*; from the posterior fontanel to the suboccipital protuberance is the *occiput*. As the longer half of the child's head is in front of the spinal column, as shown diagrammatically by two bars, one representing the axis of the spinal column and the other the head, any pressure exerted on the head will cause the flexion of the longer bar.

The *commonest position of a vertex presentation* is the left occipito-anterior. In this position the head is in the right oblique diameter, which is the longest unobstructed diameter of the pelvis. On account of the normal left lateral torsion of the uterus, the back is turned anteriorly, and the child is supposed to adapt its abdominal surface to the projection forward of the lumbar spinal column, which turns its back forward and its occiput toward the left acetabulum. If the back is to the right, the occiput usually points toward the right sacro-iliac junction, because the chin is turned forward by lateral torsion of the uterus.

L. O. A. is about 70 per cent. and R. O. P. nearly 30 per cent. of vertex presentations.

Possible presentations of the head are: (1) vertex; (2) anterior fontanel; (3) brow; (4) face; (5) ear; (6) parietal eminence.

Forces Involved.—The forces involved in the mechanism of labor are the *forces of expulsion* and of *resistance*.

The forces of expulsion are the abdominal muscles and muscles of the upper uterine segment. The lower uterine segment is the portion of the uterus that is dilated to allow the passage of the child. The boundary line between the segments, usually at or slightly above the level of the internal os,

is a perceptible ridge and is called the contraction ring of Bandl. The degree of force exerted by the combined uterine and abdominal muscles has been estimated to be from seventeen to fifty-five pounds (one estimate as high as 88 pounds). The uterine muscle exerts its force upon the uterine contents by diminishing the area of the uterine cavity and thus forcing the fetal body in the direction of least resistance.

The forces of resistance are: (1) the bony walls of the pelvis; (2) the lower uterine segment and cervix; (3) the vagina and (4) the vulva; (5) the child's head and body. The pelvis offers only slight resistance to the passage of the child of normal size. The lower uterine segment and cervix are dilated normally by a pouch of the membranes containing liquor amnii pushed down in front of the head, and exerting equal hydrostatic pressure in all directions. The membranes are assisted by the longitudinal fibers of the uterus, which help to pull the cervix up over the presenting part; by the separation of the muscle-bundles in the cervix, and finally by the fact that the cervix becomes paralyzed and then stretches mechanically.

The fetal head and body are classed as one of the forces of resistance. The head is the largest and, in labor, most important part of the fetus. The bones of the head are divided from each other by sutures; the two frontal bones being separated by the frontal suture, the two parietal by the sagittal suture; the frontal from the two parietal by the coronal suture and the two parietal from the occipital by the lambdoidal suture. At the junction of the coronal, sagittal and frontal sutures there is a lozenge or kite-shaped space called the anterior fontanel; at the junction of the sagittal and lambdoidal sutures is found a small triangular space, the posterior fontanel. The sutures and fontanels allow a certain amount of mobility to the cranial bones. By overlapping of the bones, the head is materially reduced in size during labor, particularly in cases of contracted pelvis, and the posterior fontanel almost disappears.

FIG. 43.—Method of palpating head in the diagnosis of position.

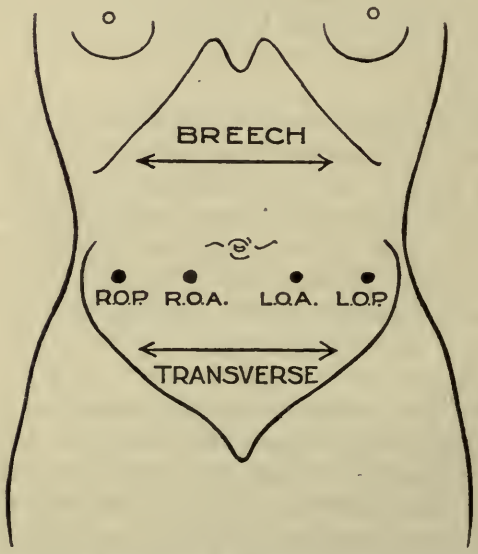


FIG. 44.—Position of heart sounds. They are heard in these positions with greatest intensity, in the different presentations, as noted.

Diagnosis of position is made by (1) abdominal palpation—to note the position of the back, head and extremities; (2) abdominal auscultation—to note the position of the heart sounds; (3) vaginal examination—to note the character and relations of the presenting part and, if a vertex, the relation of its sagittal suture to the oblique diameter of the pelvis and the position of the large and small fontanels; (4) to a limited extent by the *x*-ray.

Position of Heart Sounds.—In L. O. A. they are heard plainest one inch below and one inch to the left of the umbilicus; in L. O. P. one inch below the umbilicus and well over in the left flank. In R. O. A. one inch below and one inch to the right of the umbilicus; in R. O. P. one inch below and well over in the right flank. In breech presentation, on a transverse line about three fingers above the umbilicus; in transverse presentations; on a transverse line midway between the umbilicus and symphysis. The *x*-ray will show whether the position of the child is head or breech presentation, or transverse. It will not show the various positions of vertex or breech presentation with any accuracy.

VERTEX PRESENTATIONS

Diagnosis of L. O. A.—*Abdominal examination* shows the back to the left; the head below; the heart sounds heard plainest one inch below and to the left of the umbilicus.

Vaginal examination shows the dome of the vertex presenting; the sagittal suture in the right oblique diameter; the small triangular fontanel anterior near the left acetabulum; the large diamond-shaped fontanel back near the right sacro-iliac joint. It is difficult to feel these details unless the cervix is fairly well dilated.

Diagnosis of L. O. P.—*Abdominal examination* shows the back to the left, the head below; the heart sounds one inch below the umbilicus and in the left flank.

Vaginal examination shows the dome of the vertex presenting; the sagittal suture in the left oblique diameter; the small

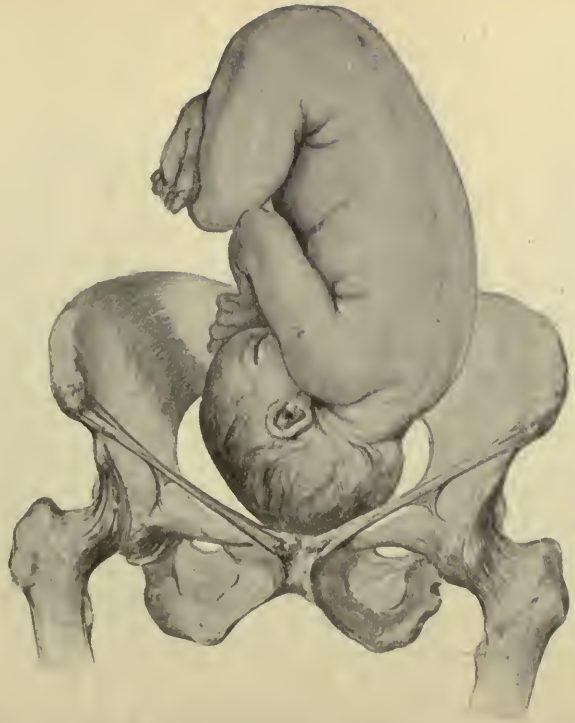


FIG. 45.—Left occipito-anterior position of a vertex presentation. (*De Lee.*)

FIG. 46.—Left occipito-posterior position of a vertex presentation. (*De Lee.*)

FIG. 47.—Right occipito-posterior position of a vertex presentation. (*De Lee.*)

FIG. 48.—Right occipito-anterior position of a vertex presentation. (*De Lee.*)

FIG. 49.—Left occipito-anterior position of a vertex presentation. (*Dorland.*)

FIG. 50.—Right occipito-anterior position of a vertex presentation. (*Dorland.*)

FIG. 51.—Left occipito-posterior position of a vertex presentation. (*Dorland.*)

FIG. 52.—Right occipito-posterior position of a vertex presentation. (*Dorland.*)

fontanel posterior near the left sacro-iliac joint; the large fontanel anterior near the right acetabulum.

Diagnosis of R. O. P.—*Abdominal examination* shows the back to the right; the head below; the heart sounds heard one inch below the umbilicus and well over in the right flank.

Vaginal examination shows the dome of the vertex presenting; the sagittal suture in the right oblique diameter; the small fontanel back near the right sacro-iliac; the large fontanel forward near the left acetabulum.

Diagnosis of R. O. A.—*Abdominal examination* shows the back to the right; the head below; the heart sounds heard one inch below and one inch to the right of the umbilicus.

Vaginal examination shows the dome of the vertex presenting; the sagittal suture in the left oblique diameter; the large fontanel back near the left sacro-iliac point; the small fontanel forward near the right acetabulum.

When during labor there is a large caput succedaneum and the sutures and fontanels are masked by it, it may be a help in diagnosis to feel high up for the child's ear, or even palpate the head by inserting the whole hand in the vagina. This is done under anesthesia, as a preliminary to a forceps delivery; it is never needed in a spontaneous delivery. In case of doubt, when a diagnosis cannot be made with certainty, few mistakes will be made if the head is assumed to be in the right oblique diameter of the pelvis, and the forceps applied accordingly.

The Mechanism of a Vertex Presentation.—The mechanism of a vertex presentation can best be described in ten steps. It is essentially the same in all positions of a vertex.

1. *Flexion and moulding* of the head, occurring from the time of subsidence of the uterus to the actual onset of labor. Its purpose is to fit the head accurately in the pelvic inlet.

2. *Further flexion and moulding*, at the beginning of the first stage of labor, is a continuation of the first step.

3. *Lateral inclination* of the head, to accommodate it to the new direction it has to take, to descend the birth canal.

The axis of the pelvic canal does not continue in the same line as the axis of the uterus, but takes a direction at first downward and backward.

4. *Obliteration of the length of the cervix and the dilatation of its canal*, by the amniotic sac.

5. *Descent of the head* to the pelvic floor, by extension of the fetal spine. The body does not follow this movement, so that the hips remain at as high a level as they were before. The child's back, which during the early stage of labor is rounded, is simply straightened out.

6. *Anterior Rotation of the Occiput.*—When the most dependent portion of the head (in a vertex presentation, the *occiput*) strikes the pelvic floor, it follows the *direction of least*

FIG. 53.—Touch picture. Normal anterior rotation of the occiput.

resistance and rotates downward, forward and inward, until it occupies a position under the symphysis. The movement is the same in all positions of a vertex presentation, except that in posterior positions the occiput has a greater distance to rotate, and the labor is consequently longer. An anterior position rotates through 45 degrees; a posterior position through 135 degrees.

7. *Birth of the head*, partly by actual propulsion along the canal and partly by extension of the head, to allow the face to be born over the perineum while the occiput is arrested under and anterior to the symphysis.

8. *Restitution.*—When the head rotates, the shoulders do

not follow the movement, and the neck is thus somewhat twisted. When the head is born the twist in the neck is corrected and this is called restitution. It is a theoretical movement and is rarely noticeable.

9. *External rotation* of the head externally following the rotation of the shoulders internally as the anterior shoulder encounters the resistance of the pelvic floor and is rotated downward, forward and inward under the symphysis.

10. *Birth of the Shoulders.*—The anterior shoulder appears first under the symphysis, emerges half way and is then arrested. The posterior shoulder slips out over the perineum, and then the anterior shoulder is entirely born, and the rest the child's body follows rapidly.

Most Common Abnormalities of Mechanism in a Vertex Presentation.—The mechanism of a vertex presentation has few abnormalities, the most important being

1. *Engagement of the head in the transverse diameter,* instead of the oblique, in contracted pelves. This diameter, if the iliopsoas and iliacus muscles are flattened out by pressure, affords greater room for the head.

2. *Imperfect flexion,* in contracted pelvis, to allow the engagement of the smaller bitemporal diameter in the contracted conjugate, instead of the larger biparietal diameter.

3. *Exaggerated lateral inclination,* in flat pelves. The angle at which the axis of the pelvic canal meets the axis of the uterus is increased, and the head has a sharper corner to turn.

4. *Slow dilatation of the cervix,* from rigidity or in contracted pelves.

5. *The head passes the promontory one-half at a time.* This is seen in flat pelves, and is a direct consequence of exaggerated inclination. The head is arrested with the parietal eminences caught on the promontory and symphysis. As the lateral inclination increases, the posterior parietal eminence rides up and allows the anterior to slip past the upper edge of the symphysis. As the symphysis, below its upper edge, shelves out, this allows the whole head to move forward enough to let

the posterior parietal eminence slip past the promontory, and the head to enter the pelvic canal.

6. *Posterior Rotation of the Occiput.*—In about 1.5 to 2 per cent. of cases, the occiput, instead of rotating forward under the symphysis, goes backward into the hollow of the sacrum.

Cause.—1. Obstacles to forward rotation such as a large head which fits tightly in the pelvis, or a hand prolapsed down beside the head, acting as a wedge to prevent forward rotation.

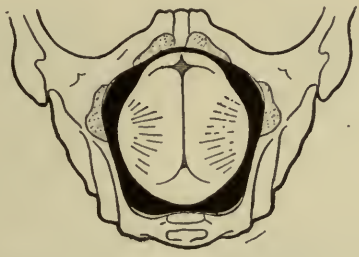


FIG. 54.—Touch picture. Occiput rotated into the hollow of the sacrum.

2. Lack of resistance, such as a lacerated perineum, justomajor pelvis or small fetal head.

3. Imperfect flexion, allowing the chin to strike the pelvic floor, and be rotated anteriorly, thus throwing the occiput posteriorly.

Effect.—1. Greatly prolongs labor.

2. Greatly increased fetal mortality (9 per cent.).

3. Greatly increased danger of laceration of the perineum.

Management.—Prevent its occurrence if possible, by the application of forceps to twist the head around, or the use of one blade of the forceps as a lever to pry the head around. If the accident occurs, spontaneous delivery is possible, but the application of forceps is usually required. The forceps is applied without rotation of the blades, laterally to the child's head, the sagittal

suture runs anteroposteriorly, the large fontanel under the symphysis. When the forceps is adjusted, traction is made by constantly raising the handles until the child's brow appears under the symphysis. The handles are then *lowered*, to extract the face; and then *raised* again, to extract the occiput. Episiotomy (oblique) is usually required, to save undue laceration of the perineum.

7. *Delayed Anterior Rotation of the Occiput. Causes.*—
   1. Excessive size of head.
   2. Errors in flexion.
   3. Compound presentations, where the hand acts as a wedge.
   4. Inertia uteri.

Management.—If the labor is unduly prolonged, and examination shows the head still to be in the oblique diameter, the best treatment is the application of forceps. The complication is most likely to occur in R. O. P. The forceps is applied in this position, the head drawn down on the perineum, and then rotated anteriorly by the forceps as rotators. The forceps (then nearly upside down) is removed, reapplied as in R. O. A. and the delivery completed. This is the *Scanzoni* maneuver, and is, except in a primipara, better than the manual rotation either on the perineum or at the pelvic brim. In posterior positions of the vertex, forceps delivery is required in about 15 per cent.

FACE PRESENTATION

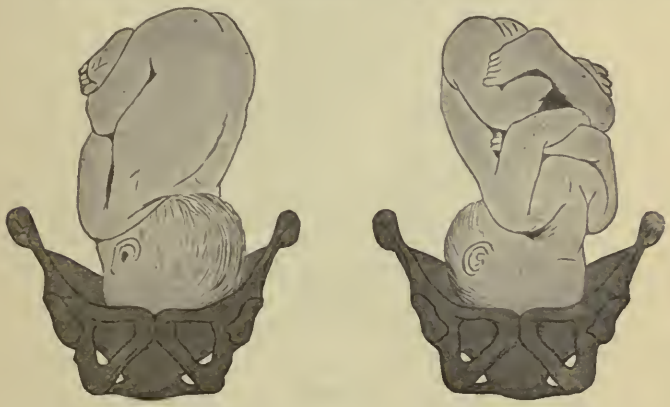
Frequency.—Face presentation occurs about once in two hundred and fifty to three hundred cases.

Cause.—A face presentation is usually due to some cause preventing proper flexion of the head, such as tumors or enlargement of the neck, coiling of the cord around the neck, marked enlargement of the thorax, etc.

Diagnosis.—The diagnosis of a face presentation is made as follows:

1. *By Abdominal Examination.*—The child is found presenting by the head, the bulk of the head to one side of the median line; a deep groove can be felt between the child's occiput and back, and the heart sounds are heard most plainly over the child's abdominal surface.

2. *By Vaginal Examination.*—The presenting part is high up; the smooth surface of the forehead forms a marked con-



Right mento-posterior. Left mento-anterior.

FIG. 55.—The two commonest positions of a face presentation. (*De Lee.*)

trast to the irregular outline of the rest of the face; when the os is dilated, the characteristic features of the face can be felt—the orbital ridges and eye-sockets, the nose, the point of the chin and the mouth with the hard line of the gums. If the patient has been in labor for some time, the features of the child's face are often obscured by edema, and the diagnosis must rest upon the discovery of the mouth. It is recognized as the mouth by the hard line of the gums within it, and by the fact that if the finger be inserted, the child, if alive, will suck upon it.

The diagnosis of position of a face presentation is made by

noting the position of the chin. If near the left acetabulum, the position is L. M. A. (left mento-anterior); if near the left sacro-iliac, L. M. P.; if near the right sacro-iliac, R. M. P.; if near the right acetabulum R. M. A. A common error in diagnosis is to mistake a breech for a face presentation.

FIG. 56.—What the examining finger feels in a face presentation, left mento-anterior position. (*Dorland.*)

Mechanism.—A face presentation almost invariably begins as a brow presentation, but becomes a face presentation as soon as labor sets in, and the head becomes fully extended. The chin is the most prominent part, and is, in a normal case, rotated anteriorly when it meets the resistance of the pelvic

floor. Hence the four positions of a face presentation are named the left mento-anterior or posterior, and the right mento-anterior or posterior. The left mento-anterior is the most common. Face presentation is dangerous to both mother and child. By steps, in a strictly normal case, the mechanism is as follows:

1. Gradual extension and moulding of the head, in the two weeks preceding labor.
2. Further extension and moulding, when labor sets in.
3. Lateral inclination of the head.
4. Dilatation of the cervical canal.
5. Descent of the head to the pelvic floor.
6. Anterior rotation of the chin, which meets the resistance of the pelvic floor, and is turned downward, forward and inward, until it rests beneath the symphysis.
7. Birth of the head, by propulsion along the canal and by partial flexion.
8. Restitution.
9. External rotation.
10. Birth of the shoulders and body, in the way already described under vertex presentation.

A face presentation with the chin *anterior*, is a possible labor and can perform spontaneously all the steps noted above. A face presentation with the chin *posterior* is an impossible labor, and cannot, without active interference, proceed beyond the point where normally the *chin should rotate anteriorly*.

Abnormalities in Mechanism.—The commonest abnormality in mechanism is the delay or entire failure of rotation of the chin under the symphysis, or its rotation into the hollow of the sacrum. To secure this rotation it is necessary for the chin to encounter the resistance of the pelvic floor. If the *chin* is *posterior* to the midtransverse line of the pelvis, on account of the disproportion between the length of the child's neck (1.5 inches) and the lateral depth of the pelvis (3.5 inches) the chin is often unable to descend far enough before the thorax begins to enter the pelvis and prevent further

progress. The chin must perform this forward movement for the head to be born.

As the uterine contractions continue, they attempt to force the upper portion of the trunk, with the posterior half of the child's head into the pelvis. As these portions of the child have a total diameter of 18 cm. (7.25 inches) it is obviously impossible to crowd them into the pelvic inlet, which has a diameter of only 11 cm. (4.25 inches), and the labor is insuperably obstructed.

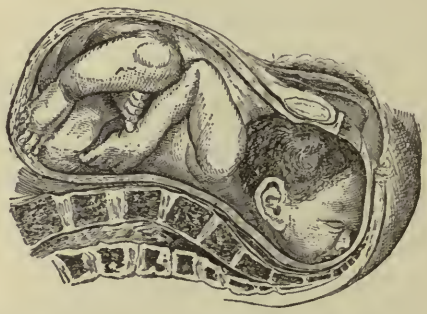


FIG. 57.—Face presentation, chin posterior in hollow of sacrum. (*Smellie.*)

Prognosis of Face Presentation.—*Mother.*—Deep perineal lacerations are common, because of the large diameter of the head (the mento-occipital) engaged as the head is born. The maternal mortality, including cases that have been mismanaged is 6 per cent. but with intelligent treatment should be very much less.

Child.—The fetal mortality, from the prolongation of labor and the undue pressure upon the child's head is 15 per cent.

Management.—If the patient is seen early in labor, and the chin is found to be well forward of the transverse diameter of the pelvis, the labor will in all probability terminate spontaneously and require no interference, but only careful watching, with more frequent examination than in a vertex presentation. If the chin is posterior, and this occurs almost as

frequently as anterior positions, an attempt should be made, if seen early, to convert the face into a vertex presentation, by flexing the head either by external manipulation (Schatz's method) or by external and internal manipulations combined (Baudelocque's method). If the labor is well advanced, an attempt should be made to secure anterior rotation of the chin by supplying the resistance usually afforded by the pelvic floor. This can be done by pressing upon the chin and posterior cheek with two fingers; by using a single blade of the forceps as a lever, which is less tiresome and more convenient than the fingers; or by applying forceps to the head and compelling rotation by twisting the head in the necessary direction.

If the chin is anterior to the transverse diameter, the forceps may be used as tractors as well as rotators. If the chin is posterior, the head should *never* be pulled upon with forceps. If all efforts at rotation fail, it may be possible, under ether, to push the head out of the pelvis (if it is not too firmly impacted) and by performing podalic version, deliver the child.

Management of Impacted Face Presentations.—If the patient is seen late in labor, when posterior rotation of the chin has already occurred, and the child's face firmly wedged in the pelvic canal, the problem is a difficult one. First it should be ascertained if the child is alive or dead. If *dead, craniotomy* offers a simple solution. If *alive*, and the head is not too firmly wedged in (as it probably is) an attempt should be made to convert it into a vertex presentation and then extract with forceps. This attempt will probably fail. If the uterus is not firmly moulded around the child's body and tetanically contracted, podalic version may be done; but this is usually a most dangerous procedure. If the case is not a proper one for it, and few of them are, a ruptured uterus will almost certainly result.

An *impacted* face presentation, with a live baby, calls usually for either pubiotomy or cesarean section; the latter being the better and safer method.

However, by this time the child is so firmly impacted that no change in its position can be made with safety; it is usually dead from the excessive pressure, and the commonest method for these impacted face presentations with the chin posterior is *craniotomy.*

BROW PRESENTATION

In brow presentation the head occupies a position midway between flexion and extension, thus presenting the largest

FIG. 58.— Left mento-posterior position of a brow presentation. (*Dorland.*)

diameters of the head to engage in the superior strait. It is the most unfavorable presentation for both mother and child.

Frequency.—A persistent brow presentation occurs once in

1750 labors. As every face presentation begins as a brow, and as a brow presentation is not infrequently converted into a vertex, primary brow presentation must be much more frequent than the figures would indicate.

FIG. 59.—Right mento-posterior position of a brow presentation. (*Dorland.*)

Cause.—The same causes account for both face and brow presentations.

Diagnosis.—The points upon which the diagnosis rests are practically the same as for a face presentation, with one exception. It is not ordinarily possible to feel the chin and mouth; as by the time these are palpable, the presentation has become a face.

Mechanism.—The positions of a brow presentation are named from the positions of the chin, and the steps of the mechanism, when possible, are exactly those of a face presentation.

Abnormalities in Mechanism.—The head is more tightly wedged into the pelvis than in a face presentation, on account of the larger fetal diameters involved. For this reason delay in rotation of the chin is the rule, and an insuperably obstructed labor from failure of or posterior rotation of the chin is common.

Prognosis.—The fetal mortality is 30 per cent. The maternal mortality depends upon intelligent management. It has been estimated at 10 per cent., but should be, in competent hands, almost negligible.

Management.—The management is that of a face presentation. It is not likely that rotation can be secured, even by using the forceps as rotators, and if the head is not firmly engaged, version will give the best results. If the head is firmly impacted the management is the same as that of an impacted face presentation.

PRESENTATION OF THE GREATER FONTANEL

Presentation of the greater or anterior fontanel is a rare occurrence. Its mechanism is practically that of a face presentation. The largest diameters of the head are involved, and extensive lacerations of the cervix and pelvic floor are very frequent.

Treatment.—It should be converted into a vertex presentation if possible, by pressing the brow upward with two fingers of one hand in the vagina, while counterpressure downward is made upon the occiput through the abdominal walls, with the other hand.

BREECH PRESENTATIONS

Frequency.—Breech presentations occur in about 3.3 per cent. of all labors. They are more frequent in multiparæ

than in primiparæ; and more frequent in multiple than in single pregnancies.

Cause.—The causes of breech presentations are usually irregularities in the shape of the fetus or of the uterus, such as dilatation of the lower uterine segment, or hydrocephalus. Their occurrence is favored by any obstruction to the normal engagement of the head, such as a contracted pelvis, or a pelvic tumor.

Diagnosis.—*Abdominal Examination.*—The head can usually be felt in the upper portion of the uterus; the back occupies

Left sacro-anterior. Right sacro-posterior.

FIG. 60.—The commonest positions of a breech presentation. (*De Lee.*)

one side of the uterine cavity and the extremities the other; the presenting part is small, easily compressible and the fetal heart sounds are heard most often above the umbilicus.

By *vaginal examination* the presenting part is small and high up; the dome-like projection of the child's head, felt in vertex presentations is absent, and by careful examination the features of the breech may be made out; the tip of the sacrum, the buttocks and the genitalia. If the membranes are ruptured, the finger is often stained with meconium. One or both feet are often felt alongside of or even below the breech. It is not uncommon for a breech to be mistaken for a face

presentation. It is not uncommon for a breech presentation to change into a head presentation. This is most likely to happen during the last month of pregnancy, and has been reported as occurring even during labor; of course before the presenting part has become engaged. A breech presentation, with presentation of one or both feet, is sometimes called a "footling."

FIG. 61.—What the examining finger feels in a left sacro-anterior position of a breech presentation. Both feet palpable. (*De Lee.*)

Mechanism.—The most prominent part of the breech is the sacrum. Hence the positions of a breech presentation are right or left sacro-anterior or posterior: R. S. A.; L. S. A.; R. S. P.; L. S. P. The flexion and moulding of the presenting part, seen in vertex presentations, is absent in a breech, because the presenting part is so small and easily compressible that it does not have to accommodate itself to the shape of the pelvic inlet. The first step in the mechanism is

1. Lateral inclination of the breech.
2. Dilatation of the cervix.
3. Descent of the hips to the pelvic floor.
4. Anterior rotation of the *sacrum*.

5. Birth of the hips.

6. Engagement of the shoulders in one of the oblique diameters, usually the right, and descent of the shoulders.

7. Anterior rotation and birth of the shoulders.

8. Engagement of the head in the oblique diameter opposite to that in which the shoulders engaged.

9. Anterior rotation of the occiput and birth of the head by the chin, face, forehead and anterior fontanel passing successively over the pelvic floor.

Abnormalities in Mechanism.—*Slow Dilatation of the Cervix.*—The breech is small, easily compressed, and an inefficient excitor of uterine contractions. It is not unusual for this step to take twenty-four to thirty-six hours.

Imperfect Rotation.—On account of the small size of the breech, the anterior hip often meets with resistance insufficient to rotate it forward under the symphysis and the hips emerge from the vulva in an oblique position.

Posterior rotation of the occiput is a rare abnormality and will be discussed in the management of a breech.

Prognosis.—Breech labors are often very long, on account of the slow dilatation of the cervix. The fetal mortality is 30 per cent., and prolapse of the cord is much more common than in vertex presentations. Prolapse of the cord is a serious complication in a vertex presentation; in a breech it is rarely serious, as the risk of compression is slight. Passage of meconium is a serious feature of any labor except a breech. It usually signifies impending death for the child. In a breech presentation it is due largely to mechanical compression, and has usually no serious feature.

Management.—If the case is seen before labor has begun, it may be converted, by external version, into a vertex presentation, to give the child the increased chance of safe delivery. The attempt to do this will often fail. If labor has set in, it should not be interfered with until the child's body has emerged up to the umbilicus. A long finger-like process of the membranes often projects through the dilating cervix,

and should not be ruptured, on account of the danger of prolapse of the cord. When the hips appear at the vulvar orifice, the patient is brought across the bed, and placed in the lithotomy position, with her hips well over the edge of the bed. The body of the child, as it appears, is grasped with both hands, and pulled down toward the floor. This throws the arms up over the head. The arms are next extracted by grasping the feet in one hand and carrying the child's body up and to one side. The opposite arm is then extracted by inserting two fingers in the vagina, locating the arm, and by

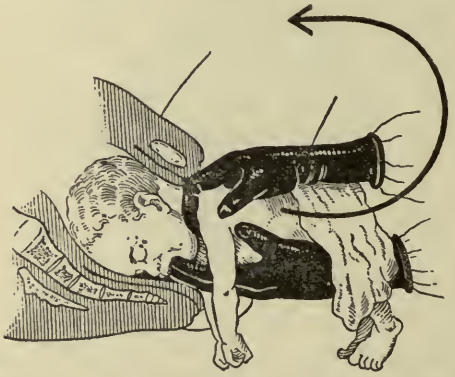


FIG. 62.—Delivery of after coming head. The arrow shows the direction the body is carried.

pressure on the forearm (*not* the upper arm) sweeping it across the child's face. The body is then carried to the other side and the other arm extracted. The head is delivered by the Wigand method of placing the child across the forearm with the middle finger in its mouth, to maintain the flexion of the head The body is then carried up over the mother's abdomen, in the so-called *curve of Carus*, aided by suprapubic pressure upon the occiput with the free hand.

When the child's body is pulled down toward the floor, one or rarely both of the arms are caught behind the neck, below the occiput. This is the nuchal position of the arms,

and it is often necessary to fracture the humerus to dislodge them. The other methods of delivering the after-coming head will be described in the chapter on obstetric operations.

Posterior rotation of the occiput should not occur, if the attendant has been careful to rotate the back anteriorly while pulling upon the body after the hips have appeared. If it occurs, its management depends upon whether the chin is free, or caught

FIG. 63.—The nuchal position of the arm. (*Dorland.*)

under the symphysis. If it is free, the child's body is carried straight down toward the floor; if it is caught under the symphysis, the body is carried up over the mother's abdomen. In any case of breech presentation, no time should be wasted after the body is born past the umbilicus.

From the time the umbilicus is born until the delivery is complete, the cord is subjected to serious compression. Hence, haste in the termination of the labor is essential. The maneu-

vers described should be performed as rapidly as is consistent with safety, until the child's face is exposed through the vulvar ring, and its nose and mouth visible. From this time on, haste is not essential, as the child can breathe, and the slow delivery of the large, posterior portion of the head will minimize the severe lacerations which commonly attend this completing step in the delivery.

In certain cases of breech presentation in primiparæ, with justominor pelves, whose measurements in themselves do not necessarily demand it, cesarean section must be considered as a means of delivery. The head cannot be fitted in the pelvis; it must come through hurriedly, extended and unmoulded, and when the decision to deliver by vagina is once acted on, it is not possible, after the body is delivered, to change and try something else. All these factors must be considered, and in certain cases cesarean section will unquestionably appeal to the physician as the best means, for both mother and child, in a justominor pelvis whose measurements, were the case one of head presentation in which a test of labor could be carried out, would not justify a section.

It is a good rule never to attend a breech presentation, or a case requiring version without having the forceps boiled and ready for use, in case any difficulty is found in delivering the aftercoming head.

In many cases, episiotomy will avert extensive or even complete perineal lacerations.

TRANSVERSE PRESENTATION

Frequency.—Once in about two hundred cases.

Cause.—Transverse presentations are seen in women with abnormal relaxation of the abdominal walls; deformities of the pelvis such as kyphosis; distention of the uterine cavity due to a fibroid tumor and rarely in cases of hydramnios or hydrocephalus. They are much more frequent in multiparæ than in primiparæ.

Diagnosis.—The abdomen is much wider than normal, and the long axis of the uterus runs transversely. The head

FIG. 64.—Shoulder presentation, right acromio-anterior. (*Dorland.*)

FIG. 65.—What the examining finger feels in a shoulder presentation. (*De Lee.*)

occupies one iliac fossa and the breech the other; the shoulder usually presents, and the heart sounds are heard most plainly

in the middle line below the umbilicus. By vaginal examination the presenting part is high up, and by careful palpation it is sometimes possible to make out the characteristics of the shoulder.

Position.—It is usually asserted that a transverse presentation has not the four positions given to the other presentations. A plan has been proposed, but not widely accepted, to name four positions of a transverse presentation from the acromion process. Hence left-acromio-anterior, etc.

FIG. 66.—Spontaneous evolution of a shoulder presentation. (One-sixth natural size, redrawn from Küstner.)

Mechanism.—Strictly speaking a transverse presentation has no mechanism. When labor sets in, the shoulder presents, an arm usually prolapses and all progress ceases. Presentations of the umbilicus or back are possible, but rare. If such a case were left to itself, the lower uterine segment would

become overdistended, the contraction ring rise higher and higher until the uterus ruptured.

Spontaneous delivery is possible in one of three ways:

(1) Evolution into a vertex.

(2) Spontaneous evolution into a breech presentation.

(3) Spontaneous delivery as a shoulder presentation, with the body doubled up (corpore reduplicato). This is most likely to happen in premature children, but the author has seen one case at full term, where the child weighed eight and one-half pounds.

Prognosis.—Unless the labor is terminated by artificial means, is bad. If the case is neglected, rupture of the uterus is to be expected.

Management.—If the case is seen before labor, it is possible, if the membranes are intact, and the abdominal walls not rigid, to transform the presentation into a breech or vertex. If seen during labor, podalic version is the better treatment. It is difficult to give a definite rule for guidance as to the safety of podalic version in labor. Ordinarily if the membranes have been ruptured, with active pains, for over two hours, or if there is a visible contraction ring, and the uterus is moulded tightly around the child's body, the danger of rupture of the uterus is too great to justify version. Except in the greatest emergency, version should not be attempted without an anesthetic.

Management of Impacted Shoulder Presentations.—When podalic version is impossible. The first step is the determination of the life or death of the child. It may be possible to auscult the heart sounds on the abdomen, but usually the hand must be inserted in the uterus, to palpate the cord. If the cord is beating, and well above 100, cesarean section is indicated. A prolapsed arm need not contraindicate the operation; the arm can be washed, painted with tincture of iodin, put back in the vagina, and the vagina cleansed, painted with tincture of iodin and packed. If the child is dead, *decapitation* is the only thing to be considered.

Bandl's Contraction Ring.—In any case of obstructed labor, and particularly in impacted shoulder presentations, the lower uterine segment is much overdistended. The dividing line between the contracting upper portion of the uterus and the overdistended paralyzed lower portion is marked by a depression, usually running obliquely across the abdomen. It is always palpable and often visible. This is Bandl's contraction

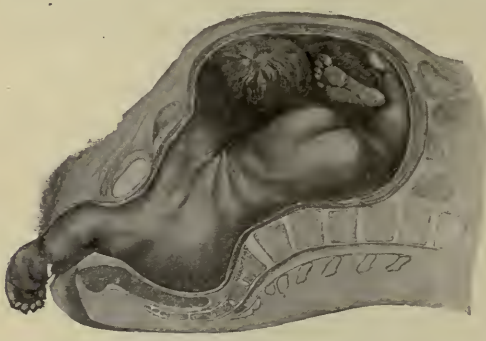


FIG. 67.—Impacted shoulder presentation, with prolapse of the arm, and high Bandl's contraction ring, An impossible labor. (*Chiari.*)

ring, and the nearer it is to the umbilicus, the greater the danger of rupture of the uterus. The upper margin of an overdistended bladder in labor must not be mistaken for it.

MECHANISM OF THE THIRD STAGE

SEPARATION AND DELIVERY OF THE PLACENTA

Separation of the Placenta.—The placenta is detached from the uterine wall by a diminution of its site. The structure of the placenta is much like a sponge, and can be compressed up to a certain point. When that point is reached, uterine contraction continues and the placenta is pulled off the uterine wall, and is expelled from the uterine cavity into the lower uterine segment and vagina. The process takes fifteen to thirty minutes. When pituitrin has been given during labor, this time is often shortened to three or four minutes.

When the placenta is detached and ready for expression, the fundus usually rises to slightly higher level.

Delivery of the Placenta.—When the placenta is loose, it is expressed by the Credé method. It is delivered like an inverted umbrella, or sometimes edgewise, with its membranes trailing up into the vagina and lower uterine segment.

Management.—As the placenta emerges it is caught in the hand. The hand holding the uterus then relaxes its grip, and the membranes are extracted by gentle traction on them, using the placenta as a handle. The practice of making a rope of the membranes by twisting them is too likely to leave some behind. If it becomes necessary to pull on the membranes themselves, sterile gauze should be used, as they are too slippery to be held in the gloved fingers. When the placenta and membranes have been extracted, they should be examined for missing portions. Any missing part of the placenta should be extracted; if anything less than one-half of the membranes remain behind, the missing portion will usually be passed spontaneously within twenty-four hours. Severe bleeding only should indicate the extraction of small missing portions of the membranes. Sometimes, when the placenta has been examined and found whole, a large piece of placenta will be passed a few days later. This is usually a placenta succenturiata, or accessory lobule, which was not detached with the main organ.

Abnormalities in Mechanism.—The placenta may be either *retained* or *adherent*. If retained, all that is necessary to secure its delivery is the proper application of the Credé method. Occasionally it is held in place by atmospheric pressure, and the Credé method fails to dislodge it. In such cases, the finger may be hooked over the edge of the placenta, and the air let in behind it, when its expulsion will be easily secured. A retained placenta is not attended with bleeding, while an adherent placenta usually bleeds profusely. It should be a rule *not* to repeat the dose of ergot until the placenta is delivered. If the

placenta is adherent, as is shown usually by the bleeding, the large size of the uterus and the complete failure of the Credé method, it must be extracted manually. Unless the bleeding justifies it, manual extraction should not be considered until after one hour after delivery. After careful cleansing not only of the hand, protected by a rubber glove, but of the vulva and vagina, the whole hand is inserted in the vagina, following the cord up into the uterus. The fingers are inserted under the edge of the placenta, and it is gradually and gently peeled off

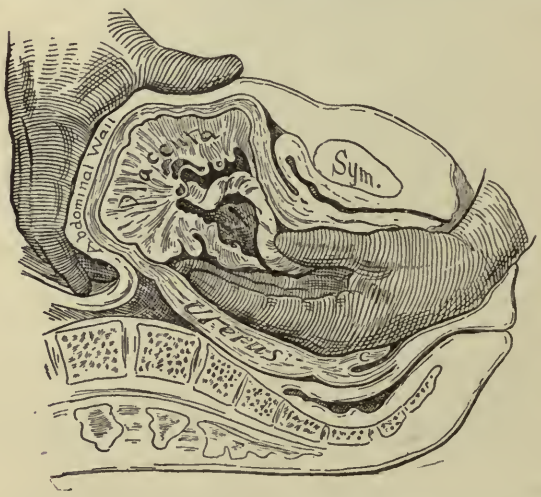


FIG. 68.—Method of manipulation for artificial separation of the adherent placenta. (*Dickinson.*)

the uterine wall. If any adhesions, too dense to be separated in this manner, are felt, they may be pinched through withthe thumb and forefinger. The loosening of the placenta is materially aided by compression by the free hand upon the fundus, through the abdominal wall. When the placenta is entirely detached, no effort is made to extract it, but the uterus is stimulated to contract by kneading it with the free hand on the abdomen, and is made to expel the hand and placenta

together. If the placenta is forcibly extracted, it may act like the piston in a cylinder, and by suction cause inversion of the uterus.

Hour-glass Uterus.—When after a reasonable wait, one hour or more, attempts at manual extraction of the placenta are made, it will sometimes be found to be retained by a

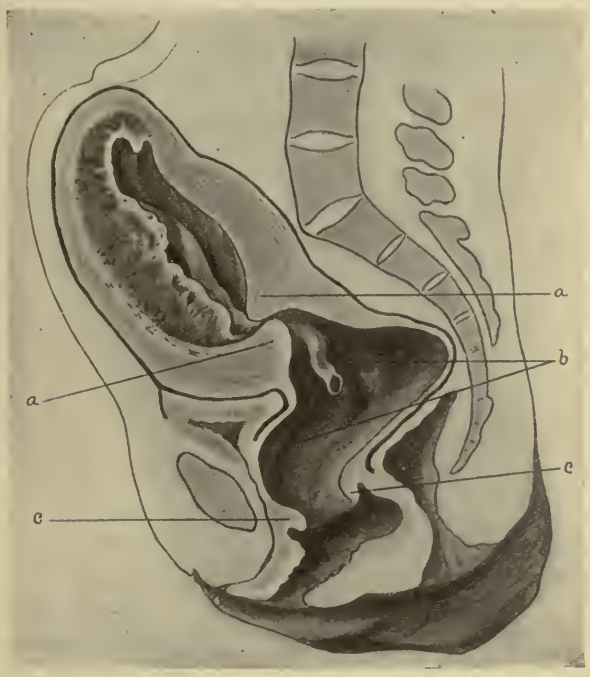


FIG. 69.—Hour-glass contraction of uterus, imprisoning placenta. (*Bumm.*)

tight contraction of the uterine muscle below it. This gives the uterus the shape of an hour-glass. The contracted ring must be dilated manually, the placenta separated, if necessary, and the contraction of the uterus allowed to expel the hand and placenta.

Intractable Adherent Placenta.—Very rarely it will be found impossible to separate the placenta from the uterine wall, without using more force than is justifiable. In these cases, the uterus and vagina should be packed, for twenty-four hours, with sterile gauze. On the removal of the gauze, the placenta usually follows it spontaneously, or can be easily expressed.

Prognosis.—The greatest dangers are hemorrhage and sepsis, which may be minimized by prompt treatment and cleanliness.

CHAPTER VIII

DISEASES OF THE OVUM AND FETAL APPENDAGES. INTRA-UTERINE DISEASES OF THE FETUS. MONSTERS

ABNORMALITIES OF THE AMNION

The amnion may be the seat of inflammation, and, as a consequence, may adhere to the newly forming skin of the embryo. As the cavity distends, these adhesions are stretched out into long bands—the *amniotic bands*. Occasionally an extremity of the fetus is caught between two of these bands and amputated. They occur usually with oligohydramnios. Other deformities of the fetus—anencephalus, exomphalos, etc., have been attributed to them.

Abnormalities of the Amniotic Fluid

The fluid may be *whitish* or *opaque; green* or *brown* if meconium is present; or *reddish*, as in the case of a macerated fetus. It may putrefy, if the fetus is dead; this has occurred, however, with a living child.

Abnormalities in Secretion.—*Excessive secretion* or *hydramnios* is not uncommon. A severe degree of hydramnios occurs once in about 150 pregnancies; minor grades much more frequently; a quantity in excess of two liters must be considered excessive. Thirty liters has been reported.

Cause.—Most frequently the fluid is derived from the fetus, although it may come from the mother alone, or from both mother and fetus. It may be due to

1. Abnormally active kidneys of the fetus.

2. Abnormally active skin.

3. Abnormal pressure in the blood-vessels of the cord or the fetal surface of the placenta. About half the cases of hydramnios have no demonstrable cause.

Symptoms.—(1) Excessive size of the uterus, especially in the latter months of pregnancy; (2) muffling of the fetal heart sounds and movements; (3) globular shape of the uterus. The uterus sometimes reaches an enormous size without marked inconvenience to the patient. About 2 per cent. of the cases are *acute*, when the symptoms are (1) intense pain, from the sudden distention of the uterus; (2) dyspnea; (3) cyanosis; (4) often excessive vomiting; (5) fever; in addition to the symptoms mentioned above.

Diagnosis.—The history of pregnancy and careful search for the above symptoms should clear up the diagnosis. Pregnancy with ascites; with ovarian cyst; with overdistention of the bladder or with twins have all been mistaken for hydramnios.

Treatment.—Usually inaction unless the distention is extreme and the patient's respiration and heart action embarrassed. In such a case, the membranes should be ruptured, either with the finger, or with some instrument passed along the finger as a guide. In either case the opening made should be partially closed by the fingers, to prevent a too rapid rush of fluid and prolapse of the cord. This treatment will usually induce labor. It is sometimes possible to reduce the amount of fluid by *sweating*. The treatment is best carried out by means of the portable cabinets, heated by steam. Hot packs are not efficient. Two sweat baths a day, of thirty minutes each, are given. The method is always worth a trial, though failures are frequent.

Oligohydramnios or deficiency of liquor amnii is rare. Occasionally the liquid is almost absent, only a few drams of clear viscid fluid remaining. The etiology is not well understood. The diagnosis is difficult and treatment is of course impossible.

ABNORMALITIES OF THE CHORION

Hydatid Mole

Synonyms.—*Hydatidiform mole, vesicular mole, myxoma chorii* and *cystic degeneration of the chorion villi.* The chorion villi are transformed into small, pedunculated cysts, filled with a clear viscid fluid, varying in size from a pinhead to a

Fig. 70.—Cystic degeneration of the chorion villi, or hydatid mole. (*Bumm.*)

small walnut. Its name refers to its fancied resemblance to a bunch of grapes. It involves usually the entire chorion, but may be limited to a small portion of the membrane.

The **cause** of hydatid mole has been much discussed, but Marchand has shown that the essential feature is found in the epithelial covering of the villus, which proliferates, penetrates the villus and probably causes the degeneration of the stroma with disappearance of the blood-vessels of

the terminal villi. The fluid contents are attributed to edema. Recent investigations have shown that there is a curious connection between the corpus luteum and the ovum. As long as the corpus luteum is healthy, the ovum remains so. If the corpus luteum is destroyed, the ovum is blighted. If the corpus luteum becomes cystic, a hydatid mole often develops in the ovum, and if in the corpus luteum there occurs an unrestrained proliferation of the lutein cells, there is a corresponding proliferation of syncytium in the ovum and a chorionepithelioma results.

Frequency.—Hydatid mole is rare, occurring once in about 2500 pregnancies. It is most frequent after the age of thirty-five, though seen at all ages. It appears early in pregnancy, rarely after the third month.

Symptoms.—The symptoms of hydatid mole often simulate an ordinary threatened abortion. There is quite profuse bleeding, associated with the signs of pregnancy. There is at first a rapid increase in the size of the uterus, and then a cessation of development. Thus in the earlier months, the uterus may be much larger than would be expected from the date of pregnancy; in the later months, much smaller than the normal. There is usually a severe *toxemia*, marked by depression, jaundice and vomiting. Hydatid mole is too frequently associated with nephritis, for the association to be a coincidence. There often occurs a discharge of one or more of the chorionic vesicles. The diagnosis rests upon the detection of these vesicles in the discharge, or on feeling the grape-like masses with the finger introduced through the cervical canal. It is not uncommon for the entire mass to be expelled suddenly, with few premonitory symptoms.

Treatment.—As soon as the diagnosis is made, the uterus should be evacuated by dilating the cervix, preferably to the size of a dollar, and with pressure on the fundus attempting to express the mass. Usually placental forceps will be required to complete the extraction. Care must be taken to prevent perforation of the uterus. If the hemorrhage is profuse, it may

be necessary to tampon the vagina until the cervix is sufficiently dilated. The earlier in its history the mole is evacuated the more severe is the bleeding. Moles removed at what

FIG. 71.—Section of uterus containing a hydatidiform mole (Bumm): *a*, Vesicles extending into blood-sinuses in uterine wall; *b*, openings of maternal blood-sinuses; *c*, os internum; *d*, cervix; *e*, vesicles extending into uterine wall; *f*, uterine veins and degenerated chorionic villi.

should be near term can usually be managed with very moderate bleeding. Those early in pregnancy are complicated by

very severe bleeding, necessitating the prompt packing of the uterus and vagina, and administration of aseptic ergot (two ampules) and pituitrin (one ampule) hypodermically. Twenty-four hours later the evacuation of the uterus can be proceeded with, though several attempts must often be made before the uterus is emptied. After the expulsion of the mole, the patient should be carefully watched at intervals of a month or two through a period of several years, to detect as early as possible a developing chorionepithelioma. If such a patient begins to bleed irregularly, the interior of the uterus must be carefully explored and the scrapings examined microscopically.

Dangers are hemorrhage; perforation of the uterus, either by manipulations in extracting the mole or spontaneously; septic infection; and the possible sequence of chorionepithelioma.

Chorionepithelioma (Deciduoma Malignum, Syncytial Cancer)

This is a most malignant growth, following labor, abortion or frequently hydatid mole. About one-half of the reported cases of chorionepithelioma have been preceded by hydatid mole. It results from unrestrained proliferation of the syncytium, and gives most rapid metastases all over the body, but particularly to the lungs, vagina and brain. The nodules are soft, spongy and purplish in color. Microscopically they consist mainly of masses of syncytial cells and large blood spaces. It may occur coincident with pregnancy or hydatid mole, or at any interval up to several years thereafter.

Symptoms are usually irregular bleeding from the uterus occurring after the puerperium is completed, accompanied by a foul smelling discharge. In many cases the appearance of metastases in the vagina was the first symptom detected. The uterus is large and soft and the os patulous. The diagnosis rests upon the microscopic examination of a portion of the tissue.

Treatment.—Combined total hysterectomy as soon as the diagnosis is made.

Prognosis.—If detected early and promptly treated by panhysterectomy, recurrence is unlikely. If seen in the stage when vaginal or other metastases have appeared, the outcome is dubious. Operation is always advisable, however, as metastases have been reported to disappear. It may occasionally be extruded like a miscarriage, and spontaneous cure result. It is usually the most rapidly growing and spreading of all the malignant tumors.

Fibromyxomatous Degeneration of the Chorion

This is a condition that may simulate hydatid mole. The mass is solid instead of cystic and is most often confined to a small portion of the chorion, at the placental site. It is usually detected in the placenta after labor.

ABNORMALITIES OF THE UMBILICAL CORD OR FUNIS

Length.—The cord may be much longer than normal, up to 198 centimeters (77 inches), or may be very short (3.5 centimeters—one and one-third inches). A long cord is likely to be coiled around the neck or extremities of the child and frequently prolapses during labor; a short one may delay the advance of the child in labor, or may cause a premature separation of the placenta.

Loops of the Cord.—The cord is frequently twisted around the neck or extremities of the child, the loops being rarely drawn taut. Occasionally they result in the child's death.

Knots of the Cord.—These are of two kinds, the *false* and *true*. False knots are due to a localized hypertrophy of the jelly of Wharton; true knots are actual knots, sometimes of a most complicated character. They are rarely drawn taut, but sometimes the vessels are compressed, the circulation is cut off and the child dies of suffocation.

Tumors of the cord are rare, and are usually myxomata or myxosarcomata, and occasionally small cysts, due to the localized liquefaction of the jelly of Wharton, are found.

Umbilical hernia, due to an arrest of development of the abdominal wall around the umbilical ring, is frequent.

Abnormalities in Insertion.—The insertion of the cord is usually near the center of the placenta, but not in the exact center. It is not infrequently inserted at the margin of the placenta, or even at some distance from the edge, on the membranes, the so-called *velamentous insertion.*

ABNORMALITIES OF THE PLACENTA

Number.—The placenta of a single child may be divided into lobes, which simulate separate organs. There may be small accessory placentæ—*placentæ succenturiatæ*—which are often retained after expulsion of the main organ. In multiple pregnancies, each child has usually its own placenta, except in unioval pregnancies.

Situation.—Normally the placenta is situated in the upper portion of the uterus. It is sometimes attached near or over the internal os—*placenta prævia* (*q. v.*); or surrounds the entire membranes—*placenta membranacea.*

Size and Weight.—The normal placenta is about seven inches in diameter and weighs about one pound. These dimensions are often increased or even doubled.

Infarcts occur in every placenta. They appear as whitish patches of varying extent. They are of no clinical importance unless of a size sufficient seriously to interfere with the placental circulation, when abortion may result.

Inflammation of the placenta is occasionally seen, usually gonorrheal in origin, and is secondary to inflammation of the decidua.

Syphilis.—The placenta shows a great hypertrophy and distortion of the villi, due to infiltration by small round cells. The degree of involvement depends on the date of the mother's infection. If she is syphilitic before conception, the entire placenta is involved; if she is infected late in pregnancy, it may appear entirely normal. A syphilitic placenta is usually whitish or pinkish in color, and if the child is expelled near

term, is considerably larger than normal. Syphilis is by far the most common cause of repeated, noninduced abortions and miscarriages.

Tumors of the placenta are rare. They are benign or malignant. The commonest benign tumor is fibromyxoma; the malignant is chorionepithelioma.

ABNORMALITIES AND DISEASES OF THE DECIDUÆ

Inflammation is not uncommon, being usually secondary to slight degrees of endometritis. Severe endometritis is necessarily associated with sterility. The inflamed decidua is greatly thickened, either localized or diffuse, and may present polypoid growths or small cysts. The rupture of these cystic decidual glands, with the sudden gush of fluid from the vagina, is one of the causes of *hydrorrhea gravidarum*.

Acute primary inflammation of the decidua, due to direct infection or to one of the exanthemata, sometimes occurs.

Hydrorrhea gravidarum is the name given to a constant or periodic flow of a serous or seropurulent liquid, resembling liquor amnii, from the vagina of pregnant women. Its causes are rupture of the membranes, hydrosalpinx, edema of the uterine walls or inflammation of the decidual glands. The quantity may be a pint or more. It usually occurs after the sixth month of pregnancy and is not unlikely to induce premature labor. The patient should be warned of this possibility. No treatment for hydrorrhea gravidarum is of any avail.

Subchorial hematoma is rare. It is due to an extravasation of blood between the decidua and chorion, in cases of polypoid inflammation of the decidua. The nourishment of the embryo is usually cut off, and pregnancy is terminated.

DISEASES OF THE FETUS IN INTRA-UTERINE LIFE

Syphilis.—This is the most frequent cause (83 per cent.) of habitual fetal death in the latter months of pregnancy. The fetus contracts the disease in one of three ways; by a

syphilitic father, the mother remaining free from infection; by a syphilitic mother at the time of conception and by the mother contracting syphilis subsequent to her impregnation. It is possible for a mother to give birth to a syphilitic child, though she herself shows no clinical signs of syphilis; she may have a negative Wassermann reaction.

Symptoms.—If the child is born alive, the most reliable signs are: its wizened appearance, like a little old man with a cold in his head; blebs and bullæ on its body; protuberant abdomen; coryza which is irritating and produces two lines of excoriation running down its upper lip; possibly linear scars of healed ulcers around its mouth or anus—the so-

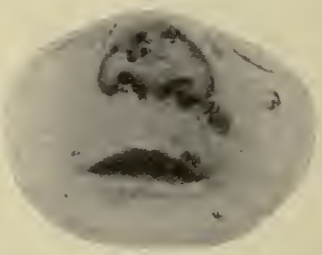


FIG. 72.—Excoriations and blebs in the face of a syphilitic child. (*De Lee.*)

called *rhagades*—and the harsh, dry and brittle skin. The blood and cerebrospinal fluid will give a positive Wassermann reaction and Spirochetæ pallidæ may be found in the fetal tissues, placenta and cord.

In a dead child, the most reliable signs are: Wegner's sign of fatty degeneration of the epiphyses of the long bones, most marked in the upper epiphysis of the femur; overgrowth of the liver, overgrowth of the spleen, and cirrhosis of the lungs —the so-called *white pneumonia*. *Wegner's sign* is the most reliable of all. The epiphyses in a normal child show as sharply drawn, bluish-white lines, about 1 mm. wide; in a syphilitic child the epiphyses show as broad jagged yellowish lines, three or four times their normal breadth.

Infection.—A child with marked syphilis whose mother shows no sign of syphilis, may nurse from her without danger of infecting her, but would almost certainly infect any other woman (Colles' law). On the other hand a syphilitic woman may nurse her apparently healthy child without fear of its contracting the disease (Profeta's law).

Prognosis is poor. Ninety-three per cent. of children born with obvious syphilis die in the first year; of the remainder not

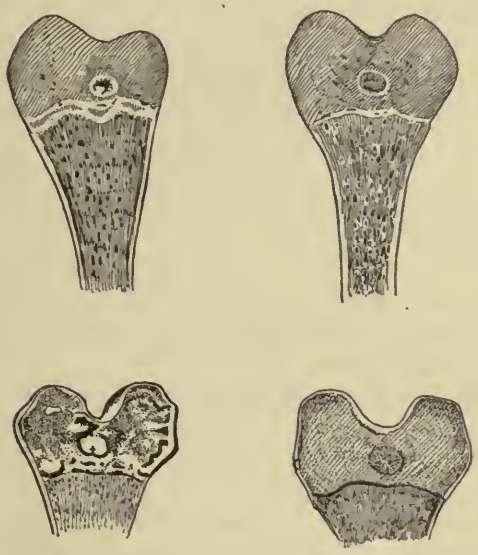


FIG. 73.—Wegner's sign of syphilis, in the femur of a syphilitic fetus. (*E. P. Davis.*)

many live to puberty. Of those who do survive the majority are ill-developed, ill-nourished and subject to complications such as ascites, hydrocephalus, and persistent skin eruptions. Dentition is delayed and shows the well-known Hutchinson's teeth.

Treatment.—If a patient presents herself with a history of repeated stillbirths, considerable tact is required to establish a diagnosis of syphilis. Wassermann tests should be made of

the blood of both husband and wife, if possible. If the wife is not already pregnant, appropriate treatment should be given to both, if both give positive reactions. If the wife is already pregnant, and her Wassermann reaction is positive, she alone need be treated, as far as the results to this pregnancy are concerned. It must be remembered that the intravenous use of salvarsan or neo-salvarsan in pregnant women is more likely to be followed by severe reactions, and that treatment must be supplemented by mercury and iodids. It is exceedingly difficult to get most patients to carry out faithfully a course of inunctions, though this is the best method of administration. If proper treatment is instituted either before pregnancy or early in pregnancy (prior to the third month) it is probable that the child will apparently be healthy and show no clinical signs of syphilis though its Wassermann will probably be positive, especially of the spinal fluid.

Treatment of Syphilis in the New-born Child.—Daily inunctions of 10 to 20 grains of mercurial ointment is the best and easiest treatment. Instead of this ½ grain of mercury and chalk, or 1/20 grain of calomel may be given four times daily. The intravenous use of salvarsan to the child is difficult of performance, and dangerous. It is also unsafe to rely upon the curative qualities of the milk of the mother who has received salvarsan. The child should be handled only with rubber gloves, and the person caring for it should be warned of the infectious nature of the disease. It should *never* be allowed to nurse from a wet-nurse.

Infectious Diseases and the Exanthemata.—It is rare for a woman contracting any of the infectious diseases during pregnancy to transmit the disease to her child. Ordinarily the placenta seems to act as a bar or filter, beyond which the infection does not extend. All these diseases are attended with a considerably increased risk of a premature termination of pregnancy. If a woman contracts any of the exanthemata and recovers without miscarriage, the child is said to be immune to future attacks.

Noninfectious diseases of the fetus, such as rickets, cystic elephantiasis, congenital polycystic kidney, congenital anasarca, etc., are rare, and such children ordinarily do not survive. Often the fetal size is so increased that spontaneous delivery is impossible.

Injuries to the fetus such as fractures of the bones, dislocations, traumatism from stabs or wounds follow sometimes violence to the mother.

Habitual fetal death is due to many causes, chief among them syphilis (83 per cent.), displacements or deformity of the uterus, inflammation in or about the uterus, chronic disease of the mother and the so-called habitual death, where no definite cause can be assigned. The diagnosis is made by exclusion and the treatment must be directed to the cause. In habitual death without demonstrable cause, which most often occurs in the latter weeks of pregnancy, a living child may be born by the induction of labor previous to the time at which the fetus has died in previous pregnancies.

Effect of Maternal Death upon the Fetus.—The child usually dies at the same time, but it is said to have survived as long as two hours (Tarnier).

Effect of Fetal Death upon the Mother.—If the child dies early in pregnancy, an abortion will ordinarily result. If it does not, the diagnosis may be difficult. The signs of pregnancy will usually subside, milk may appear in the breasts, and the abdomen fails to enlarge progressively.

The changes that take place in the fetus after death, unless it is expelled from the uterus are: (1) maceration; (2) putrefaction; (only if the membranes are ruptured); (3) saponification (adipocere—an ammoniacal soap); (4) calcification (lithopedion); (5) mummification; (6) total or partial absorption (this only in the first three months of gestation). If the diagnosis can be established, the uterus should be emptied. If the fetus dies late in pregnancy, the fetal movements cease, the heart sounds cannot be heard, and, if the pregnancy does not terminate at once, milk may appear in the breasts. If

the membranes are not ruptured the child will macerate, but not putrefy. If there is doubt about the diagnosis, the pregnancy should not be interfered with, as it is entirely possible for the physician to fail to appreciate the fetal movements or hear the fetal heart sounds, and still the child to be alive. If the child dies during labor, in cases where the choice of some operative procedure depends upon the decision, the hand can be introduced into the uterus and the cord palpated, to determine the presence or absence of pulsations.

Maternal impressions seem to affect the psychic development of the fetus and not the physical. Severe shock and fright have influenced the child's mentality, but that shocks, dreams, horrible sights, etc., so affect the child as to produce physical deformity is open to grave question.

Maternal fever does not affect adversely the fetus, unless it is raised suddenly, as in sunstroke, or to excessive heights. A temperature up to 105° or 106° F., attained slowly, does not necessarily affect the child, even if long continued.

MONSTERS

There are two classes of monsters: 1. Single. 2. Double or multiple.

Causes of single monsters: 1. Defective—when all or part of an organ is missing.

2. Deformed—when the organ is wrongly formed or displaced.

3. Excessive development—where an organ is enlarged or doubled.

4. Due to intra-uterine disease—the effects of amniotic bands, such as amputations.

Syphilis plays a prominent part in the causation of monsters. The double monsters are named from the site of their union: Sternopagus (sternum); xiphopagus (the ensiform cartilage—the Siamese twins); craniopagus (head); ischiopagus (breech) etc. The diagnosis and management of monsters is difficult and each case is a separate problem. The *x*-ray is often of great value in establishing a diagnosis.

CHAPTER IX

PATHOLOGY OF PREGNANCY

DISEASES OF THE VULVA

Edema of the vulva is not uncommon. It is due to pressure upon the pelvic veins, or kidney insufficiency, and occasionally to local infection. It may affect one or both labia, and is more common in the latter months of pregnancy. The treatment should be directed to the cause, if cause can be found, with hot fomentations locally. If the condition does not yield to treatment, the labia may be punctured, in several places, with a thin-bladed knife or needle. This may terminate pregnancy, but is occasionally followed by gangrene of the labia and the danger of infection is great.

Vegetations or venereal warts (**condylomata**) are of two kinds: (1) Flat; (2) pointed. The flat are due to syphilis, and occur in groups of three or more, on the inner surfaces of the labia and around the anus. They are associated with mucous patches and other signs of syphilis.

Pointed condylomata are due to dirt, parasites or gonorrhea. They are branched papillomata, occur over the labia and perineum, and often extend to the vagina or even cervix. They are usually partially macerated by a serous irritating discharge.

Treatment.—Pointed condylomata should be removed by the cautery about two weeks short of term, as they are liable, especially if extending into the vagina, to be crushed in labor and cause septic infection. The removal will probably bring on labor, and should be done under general not local anesthesia, unless the warts are small and few in number. *Flat* condylomata should not be touched locally, as if removed,

they always recur more extensively than before. They will respond to constitutional treatment for syphilis.

Pruritus is due to diabetes, irritating leukorrhea, dirt and parasites or neurosis. The itching is intense. The treatment should consist in relieving the cause, and local applications of very hot water, strong solutions of nitrate of silver, (20 to 40 gr. to the ounce) or of carbolic acid, or menthol ointment 5 per cent.

The most satisfactory local application has been the following lotion:

℞ Acid carbolic	gr.xlv
Acid boric	ʒiss
Pulv. zinc oxid	ʒiii
Glycerin	ʒi
Aquæ camphoræ q. s. ad	ʒvi

M. Sig. To be applied frequently with absorbent cotton.

In neurotic pruritus no treatment may be of avail and pregnancy may have to be terminated. Rarely the neurotic type of pruritus may persist after delivery, and require surgical interference. This is never necessary in the other forms. It consists in (1) amputation of the labia, which is unsatisfactory because of the persistent itching of the scar, so that the patient is as uncomfortable as before; or (2) resection of the five pairs of sensory nerves; (1) genital branch of genitocrural; (2) ilioinguinal; (3) inferior pudendal; (4) perineal branches of the pudic; (5) dorsal nerve of the clitoris. *X*-ray treatments are efficient in many cases, and give a high percentage of cures. Radium is disappointing.

Varices of the labia are occasionally very large. Fatal hemorrhage has occurred. They should be protected from injury, as hemorrhage is always dangerous, and must be controlled by pressure of a vulvar pad or ligature. The patient should be instructed how to apply pressure, with a gauze pad, to check the bleeding temporarily, if the vein ruptures.

Cancer of the vulva is very rare in pregnancy. The age of the patient is usually beyond that of child-bearing. If it occurs, it should be operated on at once regardless of the pregnancy, and the scar subsequently treated with *x*-ray or radium. The prognosis is bad.

Lupus vulvæ is also very rare. The patients usually suffer severely, and the only treatment is the energetic use of *x*-ray.

DISEASES OF THE VAGINA

Vaginitis is usually of the granular variety, due to gonorrhea. An irritating leukorrhea, with the reddened granular

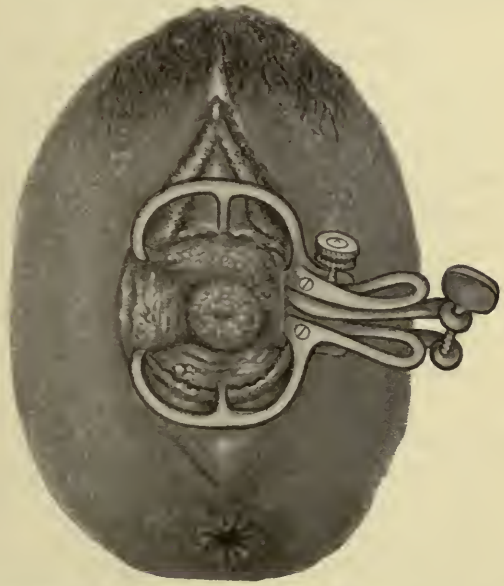


FIG. 74.—Granular vaginitis in pregnancy. (*B. C. Hirst.*)

appearance of the vagina, are the most prominent symptoms. Venereal warts on the cervix and vulva, may be associated with it. Treatment should be avoided, if possible, on account of the danger of miscarriage. The best treatment is the

local application, through a skeleton speculum, of 30 per cent. carbolic acid in glycerin, or of a 40 grain to the fluid-ounce solution of silver nitrate. If carbolic acid is used, the vulva and buttocks should be well greased with vaselin. Routine douching is not advisable. The patient should be warned of the possibility of miscarriage, due to the irritating nature of the treatment.

An *emphysematous vaginitis*, due to the Bacillus emphysematosus vaginæ is sometimes seen. It follows colpohyperplasia cystica, when the fluid in the cyst is replaced by gas (trimethylamin).

Varices occur as in the vulva and require the same treatment.

Suburethral hypertrophy of the vaginal mucosa is common. It is of no importance, but sometimes is of such extent as to simulate cystocele. It usually requires no treatment, but can be excised if annoying to the patient.

Suburethral abscess is due to infection from Skene's glands. It looks not unlike a cystocele, but is hard and brawny in feel, and pressure causes pus to exude from the urethra. It is drained like any other abscess.

Vaginal cysts are of two kinds: (1) Lymphatic cysts—which may occur anywhere; and (2) cysts of Gärtner's duct in the anterior vaginal wall. They are occasionally so large as to obstruct delivery and to require puncture.

Parasitic infection, or **mycosis vaginæ** is seen in white patches, like thrush. It is due to the Leptothrix vaginalis and is easily curable by mild antiseptic douches, such as 10 gr. to the ounce of boric acid.

Vaginal cancer requires immediate operation, regardless of pregnancy. If too advanced for operation, cesarean section, two weeks short of term, will be required.

Vaginal hernia is exceedingly rare. It is most commonly *lateral* or *posterior*.

DISEASES OF THE CERVIX

Diseases of the cervix are usually inflammatory in character, and often cause exaggerated or pernicious vomiting. The inflamed and eroded cervix frequently bleeds irregularly, simulating persistent menstruation. An inflamed cervix is treated on the same principles as granular vaginitis, with 40 grains to the ounce of nitrate of silver, applied through a bivalve speculum.

Cancer of the cervix complicating pregnancy is rare. If it occurs, the prognosis is extremely unfavorable. The majority of patients abort. If pregnancy goes to term, the mortality from hemorrhage or septic infection is nearly 50 per cent., if the patient is allowed to fall in labor. If cancer is discovered early in pregnancy, the uterus should be removed at once; if late in pregnancy a cesarean section followed by abdominal panhysterectomy is the proper treatment.

Cervical polyps do not complicate pregnancy except by bleeding. They are easily seen through a speculum, and removed by torsion.

Cervical condylomata are rarer than vaginal. There is great risk of their being crushed in labor, and causing septic infection. They should be removed by cautery in the last two weeks of pregnancy. Anesthesia is usually not necessary.

DISEASES OF THE UTERUS

Displacements.—The uterus may be displaced *backward* (retroversion); *forward* (anteflexion); *laterally*; may be *prolapsed*; may form part of a *hernia*.

Retroversion or **retroflexion** of the pregnant uterus results most often from pregnancy occurring in a uterus already retroverted. The organ may fall backward after impregnation. Retroflexion is the more common.

Symptoms.—The most prominent symptom is *dysuria*, from the mechanical obstruction of the urethra by pressure of the cervix against the symphysis. Later the overflow of reten-

tion may develop. Other symptoms are backache, headache, persistent pelvic pain and possibly bleeding. The occurence of any of these symptoms in a pregnant woman indicates an immediate vaginal examination.

Diagnosis.—With two fingers of one hand in the vagina, *in front* of the cervix, which is abnormally high, pressure with the

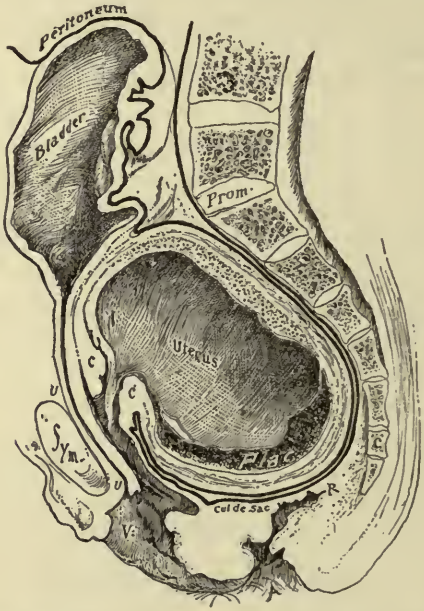


FIG. 75.—Backward displacement of a pregnant uterus, of 3½ to 4 months. Distention of the bladder and extreme elongation of the urethra. (*B. C. Hirst.*)

other hand on the abdomen above the symphysis fails to elicit the rounded bulk of the uterus. If the fingers of the hand in the vagina are moved behind the cervix, the body of the uterus is felt lying in the hollow of the sacrum and filling the pelvis.

Terminations.—Most commonly, spontaneous reposition by contraction of the longitudinal muscle fibers of the anterior wall, at about the third month of pregnancy. Next in frequency,

abortion; incarceration or wedging of the uterus in the true pelvis followed possibly by inflammation and gangrene. Rarely the pregnancy may go to term, by the overstretching or *sacculation* of the anterior uterine wall.

Treatment.—While spontaneous reposition is the most common termination, it is not safe to wait for it to occur, on account of the danger of incarceration. The patient should be placed in the lithotomy position and catheterized. A long stiff silk or linen catheter is needed, sterilized by soaking in *cold* 1–1000 bichlorid of mercury solution or 1–20 carbolic acid. Soft rubber or glass catheters are useless. A male prostatic catheter may be needed, or even paracentesis may have to be done. It is impossible to replace the uterus until the bladder is emptied. The physician places two fingers of one hand in the vagina and behind the cervix and makes pressure upward and slightly to one side, to escape the promontory of the sacrum, until the fundus can be reached through the abdominal wall by the fingers of the other hand and pulled forward. If this fails, the knee-chest posture and a repositor should be tried, to push the uterus forward. This method is materially aided by fastening a tenaculum on the anterior lip of the cervix and pulling down while the fundus is pushed up by the repositor. Anesthetics are often necessary. If the attempt is successful, the uterus must be supported by a pessary, until it is too large to slip back into its old position—about the fourth month. If the uterus cannot be replaced, there is a choice between abdominal section and reposition, or the termination of pregnancy.

Incarceration.—If the uterus is incarcerated it may be impossible to catheterize the patient. A long stiff silk or linen catheter must be used and if the attempt fails, suprapubic puncture of the bladder is justifiable. It may then be possible to replace the uterus; if not, it must be emptied.

Anteflexion of the uterus is physiologic and usually gradually corrects itself as pregnancy progresses. The uterus may protrude between the recti muscles and in that case must be

supported by an abdominal binder. If the anteflexion is the result of an operation for suspension of the uterus, it may be serious. The adhesions either break spontaneously or preg-

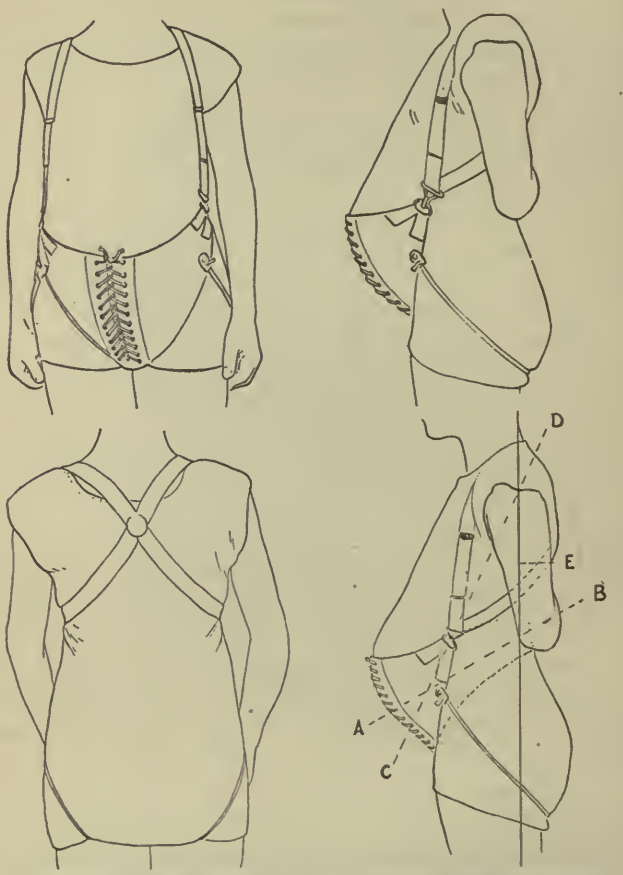


FIG. 76.—Patterson's abdominal supporter, for relaxed pendulous abdomen. (*Redrawn from B. C. Hirst.*)

nancy may proceed to term by a sacculation of the posterior uterine wall.

Lateral Displacements are not serious and in pregnancy rarely require more than the use of longitudinal pads and an abdominal binder.

Prolapse almost invariably occurs from pregnancy in a uterus already prolapsed, or it may be due to the increased weight of the uterus. All or part of the cervix usually projects from the vagina, when the woman is erect, and in the early months the whole organ may protrude.

FIG. 77.—Posterior displacement of the cervix at term. (*Dickinson.*)

Terminations.—Complete or partial reposition, which is the most frequent and occurs about the third month; abortion or incarceration.

Treatment.—The uterus must be replaced, and a suitable support worn; the best being the ball-and-stem pessary, supported by straps from an abdominal belt or Goddard's aluminum ring pessary. Soft rubber implements, intended to remain in the vagina, should never be used on account of the foul discharge they cause. If the uterus is incarcerated, pregnancy must usually be terminated.

Posterior displacement of the cervix is seen only in primiparæ. The anterior portion of the lower uterine segment is overstretched, and the cervix will be felt far posterior, and high up near the promontory of the sacrum. In the ordinary examination, no cervix or cervical canal can be felt; it is necessary to reach high up behind the head to feel it. It is of no importance *in pregnancy*. *In labor*, it may cause serious delay; due to the failure of the cervix to dilate. If the forefinger is hooked in the canal, and traction made *during a pain*, the difficulty is quickly overcome.

Rheumatism of the myometrium sometimes occurs, marked by violent abdominal pain, without variation in the pulse or temperature. The administration of salicylates clears up the diagnosis, and affords relief inside of twelve hours.

NONTOXIC DISEASES OF THE ALIMENTARY CANAL

Appendicitis in pregnancy is more serious. The following conclusions are advised:

1. If a patient has had appendicitis, and becomes pregnant, operation should be recommended.

2. In appendicitis in pregnancy, operation and not palliative treatment should be followed.

3. The later in pregnancy the attack, the more likely it is to be fulminant.

4. The later in pregnancy the attack, until the sixth month, the higher up and nearer to the umbilicus is the incision. After the sixth month, the incision is median.

5. Operations in early pregnancy do not endanger the fetus.

6. If it is necessary to operate after the sixth month, the uterus will have to be turned out of the abdominal cavity, and emptied by a cesarean section before being replaced. This is particularly needed in drainage cases, and often hysterectomy as well.

Caries of teeth, due chiefly to the acid saliva, is common. The remedy is an alkaline mouth wash, and if any dental

work is required, it should be of a temporary character, and prolonged sessions in a dentist chair avoided.

Gingivitis and pyorrhea are aggravated by pregnancy. Mouth washes containing astringents, local sponging with tincture of ipecac and hypodermic injections of emetin give the best results.

Constipation should be relieved by mild laxatives. Calomel particularly should be avoided. The best combination is one of cascara and phenolphthalein, the dose varied as required.

Diarrhea is best checked by paregoric one dram, chalk mixture two drams and bismuth subnitrate five grains.

Hemorrhoids are common and distressing. The best results are obtained from the use of the bidet, and the following prescription:

℞. Cocain hydrochlor. ..... gr x
Ointment of nutgall .....
Ointment of belladonna..... aa oz 1

Sig. Apply three or four times daily, inside the rectum, after the hemorrhoids are replaced.

The bowels are kept loose and straining at stool is to be avoided.

Liver degenerations belong really to toxemia. In the toxemia of early pregnancy with hyperemesis the degeneration of the liver begins in the center of the lobule; in the toxemia of late pregnancy, with eclampsia, the degeneration begins in the periphery.

Ptyalism.—The saliva is alkaline, and is secreted in large quantities (as high as 51 ounces daily). The cause is obscure; a neurosis or possibly auto-intoxication. It may depend, as seems to do the nausea of pregnancy, upon the failure of absorption of the corpus luteum of pregnancy. It is seen mostly in the first four months of pregnancy. Treatment is disappointing. Belladonna, atropin, astringent mouth washes may be employed. Hypodermic injections of 1 mil daily of

corpus luteum extract has succeeded in relieving, but not curing, two cases of the author's.

Vomiting will be considered under *toxemia of pregnancy.*

DISEASES OF THE BREASTS

Nipples should be hardened for nursing by astringent applications such as glycerite of tannin; alcohol; or witch-hazel. If they become fissured, protection by a nipple shield and an ointment of bismuth subnitrate and albolene, equal parts, will usually give prompt relief.

Tumors.—*Adenomata* usually grow rapidly during pregnancy.

Carcinomata occur rarely, as the patients are usually past childbearing age. When cancer complicates pregnancy, it is always aggravated by it.

DISEASES OF THE CIRCULATORY SYSTEM

Heart.—Systolic murmurs at the base and accentuation of the second aortic sound are not uncommon in pregnancy, and are usually without significance.

The *commonest variety* of real heart-disease is *mitral regurgitation;* combined mitral disease coming next. These two form the over-whelming majority of heart lesions in pregnancy. Valvular disease is less to be feared than myocarditis, which is fortunately rare. An abnormally wide divergence between the systolic and diastolic blood-pressure usually indicates myocarditis, and the patient should be watched accordingly.

Contra-indications to Pregnancy.—A heart with valvular lesions, well compensated, and particularly in young, otherwise healthy women, does not, with proper treatment, contra-indicate pregnancy. A heart with decompensation will almost certainly fail in pregnancy or labor.

Danger during pregnancy are broken compensation; dyspnea from pulmonary congestion; serous transudations in the pleura, requiring paracentesis; acute dilatation of the heart. Second-

arily albuminuria, nephritis, and occasionally symptoms of Graves' disease.

Danger during labor is chiefly acute dilatation of the heart. Decompensation may also appear first in labor.

Treatment in pregnancy consists in expectancy under careful medical supervision. Ascending doses of tincture of digitalis or strophanthus, beginning with a dose of five drops three times daily and increasing a drop a dose at intervals of about two weeks. Moderate exercise with frequent intervals of rest. Frequent examinations of the urine, and if much dyspnea, morphin and atropin hypodermically. Labor should be induced four weeks before term, if there are any symptoms of decompensation; or two weeks before term in any case.

Treatment in Labor.—Stimulation with digipuratum hypodermically (one ampule every three hours) during the course of labor, and every six hours for three days following (or tincture of digitalis m. x. by mouth); delivery with forceps when the expulsive pains of the second stage begin, with as light ether anesthesia as possible.

In *decompensation*, rapid delivery without anesthesia, and active stimulation.

In *acute dilatation of the heart*, immediate delivery, active stimulation (1 ampule of digipuratum; of 1 mil digalen; or 30 minims of camphorated oil), oxygen, a tight abdominal binder—all except the binder to be given during the process of delivery and continued afterward. In all cases make preparations for any complications beforehand.

Prognosis.—The most critical time is just after delivery. Sudden collapse several hours afterward is not uncommon. The mortality is variously stated at from 6 to 80 per cent. The lower figure is more nearly correct. A tendency to moderate bleeding after delivery should not be checked, as it is usually beneficial. The *danger to the child* is great, stillbirths averaging 50 per cent.

Graves' disease is liable to be serious in pregnancy, though sometimes improved by it. If toxemic symptoms develop,

the case is always more serious. The treatment is the same as for heart lesions, except that rapid delivery is usually not needed. If an anesthetic is required, ether is the only one to be considered.

Varicose veins occur chiefly in the legs, thighs and labia majora. They are unmistakable, and usually cause considerable discomfort. *Dangers* are rupture with hemorrhage (dangerous), thrombosis and infection (from scratching).

Treatment during pregnancy requires an elastic stocking or bandage, for the varices of the legs. Those of the labia require no treatment. The patient should be instructed how to control the bleeding by pressure, in case of rupture. Rest is essential and if there is much inflammation dilute leadwater and alcohol, equal parts, is the best application.

BLOOD DISEASES

Pernicious anemia and leukemia often originate in pregnancy and are always aggravated by it. **Purpura** is usually fatal and always kills the child.

INFECTIOUS DISEASES

All the infectious diseases are made worse by pregnancy and abortion or miscarriage is to be expected in about 50 per cent. of cases.

INJURIES AND ACCIDENTS

Any severe shock is liable to cause abortion, and falls during the last three months of pregnancy not infrequently cause rupture of the uterus or premature separation of the placenta.

RELAXATION OF THE PELVIC JOINTS

Relaxation of the pelvic joints, especially the sacro-iliacs, is to a certain extent present in every pregnancy. Occasionally it is enough to cause severe backache, difficulty in walking or even entire inability to walk. Mild cases can be managed

by lacing the lower third of the corset tightly over the hips. Severe cases require a binder or adhesive straps. It usually persists for several months after delivery, and requires similar support.

DISEASES OF THE NERVOUS SYSTEM

Chorea in pregnancy is a recurrence of an old chorea and is serious. Sixty per cent. of the cases occur in primiparæ. The disease is greatly aggravated by pregnancy and it has a mortality of 18 per cent. Blood examination shows marked eosinophilia. The mild cases usually yield to bromids, arsenic and iron; the severe ones require anesthesia for temporary control, and the prompt interruption of pregnancy.

Epilepsy is not influenced by pregnancy, except that often the convulsions cease during pregnancy, only to reappear after delivery.

Insanity.—Frequency 1–400 cases.

Types.—1. Mania (homicidal).

2. Melancholia (suicidal).

3. Mental confusion.

Time of occurrence most frequently in the puerperium; next during lactation, and least frequently in pregnancy. This does not take account of the temporary delirium often seen in labor.

Treatment is best carried out in an asylum and based upon good hygiene and full diet. The tendency to homicide (of the infant) and suicide must never be forgotten, and the patient watched accordingly.

Neuralgia is most frequent in the sacral plexus, often causes considerable lameness, and is obstinate to treat. It will usually remain until after delivery. Other local neuralgias are most often symptoms of toxemia, and treated accordingly.

Operations in pregnancy do not, as a rule, greatly increase the risk of abortion, but are to be avoided unless urgent. In nervous patients even the pulling of a tooth may precipitate abortion.

DISEASES OF THE RESPIRATORY SYSTEM

Tuberculosis in pregnancy is always serious. An existing infection is made worse; a latent one often made active. The superstition among the laity that tuberculosis is benefitted by pregnancy is erroneous. A patient with phthisis should be warned against pregnancy; and the presence of active phthisis in a pregnant woman in early pregnancy is a justifiable indication for the premature termination of pregnancy.

Epistaxis is common and often serious enough to require packing of the nares. Often it will not cease until pregnancy is terminated.

Asthma is unfavorably influenced by pregnancy.

Hemoptysis is not always due to phthisis. It is seen in the "cardiac nerve storms" of pregnant women, and in these controlled by chloral and bromids.

DISEASES OF THE SKIN

Pruritus may be general or confined to the genitalia.

Pruritus vulvæ is due to: (1) dirt or parasites; (2) irritating leukorrhea; (3) diabetes; (4) neurosis. If a cause can be found and relieved, the itching will cease spontaneously. If it is neurotic, local applications of carbolic acid ½ of 1 per cent.; menthol ointment gr. 30 to oz. 1; oil of bitter almonds; nitrate of silver gr. 10 to oz. 1 may be used. Often the termination of pregnancy will be required.

In diffuse pruritus, the itching seems to depend upon the lack of oil in the skin. Hence the use of glycerin soaps, glycerin, olive oil or cocoa butter by inunction will give the best results. This diffuse pruritus is called "prurigo gestationis."

Pigmentation of the skin is often persistent throughout pregnancy, but usually disappears after labor. If not, lemon juice is the best local application.

Brittle or loose finger nails annoy the patient, and cause much pain. Treatment is disappointing, chiefly tonics and oil applied locally. Recovery is spontaneous after delivery.

Impetigo, herpes and molluscum fibrosum are all aggravated by pregnancy, and often first appear in pregnancy.

Tumors complicating pregnancy will be described in the chapter on dystocia due to maternal soft parts.

DISEASES OF THE URINARY SYSTEM

The urine in pregnancy is always increased, and often to great excess. The polyuria ceases after delivery and no treatment is needed. If the quantity is diminished, the cause should be investigated at once.

Albuminuria will be described under the toxemia of pregnancy.

Sugar is next in importance to albumen. It is usually *lactose* and is unattended by systemic symptoms. True glycosuria is rare and if present is greatly aggravated by pregnancy, although diabetes mellitus may, in certain cases, irregularly appear in each pregnancy and disappear after delivery. Sugar appears in the urine in about 1 per cent. of all cases. The differential diagnosis between lactose and glucose can be made by polarization.

Hematuria is usually due to vesical hemorrhoids, papilloma, stone or acute cystitis and will disappear after labor. The bleeding is usually not profuse enough to require treatment.

Diseases of the Bladder

Irritability is common and due to congestion, pressure from a displaced uterus or neurosis. If a displacement is found and corrected, the irritability will cease. For other cases the best prescription is one containing sodium bromid, gr. 10, potassium citrate, gr. 5, tincture of belladonna, gtt. 5, liquor potassii citratis, drams 2 to each dose, four times daily.

Incontinence is usually that of overflow, and due to a displaced uterus. Reposition of the uterus and the use of the catheter will relieve it.

Cystitis is aggravated by pregnancy. It is treated by daily irrigations with boric acid solution and the instillation of one

ounce of 1 per cent. hegonon, or 25 per cent. argyrol solution, or 5 per cent. silvol solution, to be retained as long as possible.

Stone in the bladder is very rare, but when it occurs should be removed before labor, to prevent a fistula.

Diseases of the Kidney

Nephritis will be described under toxemia of pregnancy.

Dislocation of the kidney is almost always the right. Unless it is so low as to be in the pelvis (usually the congenital ectopic kidney) or twists on its ureter to give acute hydronephrosis, it is of little moment. If acute hydronephrosis develops, catheterization of the ureter is indicated. If this fails to give relief, induction of labor is required. The removal of one kidney does not usually influence unfavorably any subsequent pregnancy.

Pyelitis in pregnancy is common. It may occur any time in pregnancy, but is most common in middle trimester. *Predisposing causes* are the tendency to hydro-ureter and hydronephrosis due to a movable kidney or direct pressure on the ureter against the pelvic brim, by the bulk of the pregnant uterus. The actual infecting agents are: (1) Bacillus aërogenes mycosum (differing from the colon bacillus in being nonmotile); (2) colon bacillus; (3) pneumococcus; (4) gonococcus; (5) staphylococcus; (6) streptococcus (in puerperium).

Symptoms.—1. High fever; (2) leukocytosis; (3) pain in loin and referred down ureter; (4) pyuria.

Diagnosis by the above symptoms and, if necessary, cystoscopy and the inspection of the eroded ureteral orifice. Cloudy urine can be seen issuing from it.

Differential Diagnosis.—The commonest mistake is to confuse this with appendicitis. The diagnosis should offer no difficulty.

Treatment.—Palliative.—(1) Rest in bed on side opposite the affected one; (2) ice-bag to affected loin; (3) large amounts of water; (4) milk diet; (5) urinary antiseptics (salol, urotro-

pin, helmitol); (6) bladder irrigations, to help ureteral peristalsis and aid drainage.

Radical.—Cystoscopy; catheterization of affected ureter, washing out of pelvis of kidney with boric acid solution,

FIG. 78.—Method of withdrawing contents of an ampule, for hypodermic injection. The ampule is held upside down, the needle inserted in the neck, and the syringe is pushed up by forefinger of right hand.

followed by 1 per cent. hegonon, or 5 per cent. silvol solution. This, possibly repeated, will cure most cases. If it does not, induction of labor will be required. Unless neg-

lected, nephrotomy and drainage or nephrectomy will rarely if ever, be required.

Causes of right-sided pain in women are: (1) Cholecystitis or gall-stones; (2) fecal impaction in hepatic flexure of colon; (3) floating kidney with hydronephrosis; (4) kidney stone; (5) ureteral stone; (6) pyelitis; (7) appendicitis; (8) salpingitis; (9) extra-uterine pregnancy; (10) ovarian cyst twisted on pedicle; (11) varicose veins in broad ligament.

Functional Tests for Kidney Activity.—*Indigocarmine.*—If 1 mil of indigocarmin is injected in the thigh; blue urine should be seen, through the cystoscope, to emerge from the ureters in about twelve and a half minutes. Delay usually indicates improper function, though exceptions are numerous.

Phenolsulphonephthalein.—Two to four mils of phenolsulphonephthalein are injected deep in the patient's thigh. She is catheterized immediately before the injection; again in one hour and ten minutes and again in one hour. The last two specimens are saved. Their color is compared with the color in the colorimeter vials. About 60 per cent. is the normal excretion in two hours. Less indicates improper function, although wide variations are seen with few or no symptoms.

Cystoscopy

Methods.—(1) *Air distention of bladder* and *direct* vision.

(2) Water distention of the bladder with *indirect* (inverted) vision. The method of choice in most cases. The air-distention method requires either the knee-chest or very high Trendelenburg position; often an anesthetic; and, due to the interference with breathing, is impracticable late in pregnancy.

Directions for Use of Air Distention Cystoscope.—1. The patient is arranged in the high Trendelenburg or knee-chest position.

2. Urethra cleansed, cocainized with 4 per cent. cocain solution and dilated with either conic or cylindric sound.

3. The cystoscope is inserted, with obturator in place; obturator withdrawn and light turned on.

4. The urine, as it collects, is aspirated by suction with a catheter and bulb. The habit of drying the bladder with gauze strips is pernicious. It is too likely to injure the vesical mucosa.

Directions for Use of the Water Distention Cystoscope.—

1. Patient lithotomy position, no ether.

2. Cleanse urethral orifice, and if very small, use small urethral sound (22).

3. Have cystoscope, cord, and catheters sterilized by formalin vapor. If wiped off with alcohol, never get it or any other fluid on eye piece.

4. Easiest to use examining lens first to locate ureters, and then change to catheterizing lens.

5. Lubricate *light* of scope *only*, never get anything on lens, and use only glycerin or water-soluble lubricant.

6. Insert cystoscope, turn upside down (except in direct vision scopes), attach irrigating tube, and light cord.

FIG. 79.—Sterilizing plant for cystoscopes and catheters. Loose formaldehyd powder in bottom of jar. Efficient and inexpensive.

7. Allow water to run in bladder, until patient feels desire to urinate, then cut off and turn light on slowly. *Too little water in bladder is the commonest cause of trouble.*

8. Always work with as little light turned on as possible. Lights are easily burned out and are expensive.

9. If fluid is cloudy, let water run in and out until clear.

10. Look for ureters by turning cystoscope at angle of 45° to perpendicular on each side of bladder. If a doubtful spot is seen and you cannot be sure whether it is the ureter, watch it for a few seconds. If it is a ureter, it will spout urine.

FIG. 80.—Type of syringe for irrigating kidney. It has a capacity of 5 mils.

11. When finished with examining lens, turn light off, remove cystoscope, change to catheterizing lens, insert catheters and proceed as before to insert cystoscope and find the ureters.

12. To catheterize ureter, when located, focus it at about 5 o'clock (right) or 7 o'clock (left) using the field as a clock face. Push catheter down till visible past lens. Guide it in proper direction with the hinged flap worked from the handle of scope and push in mouth of ureter. When in, put flap down flat again and then push catheter up to pelvis of kidney.

13. To push catheter in, grasp it with fingers as near where it enters the cystoscope channel as possible. Otherwise it will bend.

14. *Never* catheterize a *healthy* ureter from an *infected* bladder.

15. To wash out pelvis of kidney use a hypodermic syringe and boric acid solution and then hegonon 1 per cent. or silvol 5 per cent. The pelvis of the kidney should hold 10 to 15 mils but be guided by patient's complaint of pain, and never persist after pain starts and never use force in injecting the fluid.

16. To remove cystoscope turn off light, disconnect water tube, *be sure guiding flap is flat down* and remove.

17. To leave catheters in, push up as far as possible, allowing them to curl up in bladder. Leave only ½ inch of catheter beyond eyepiece of cystoscope. Then remove cystoscope as in number 16. When catheters appear at urethral orifice, hold them and pull cystoscope away from them. Fix them to thighs with adhesive tape, let drain into bottles and be sure before removing the cystoscope that you know which is right and which left.

18. After using dry cystoscope with gauze, dry catheters by wiping off and keep them with aluminum wire stylets in

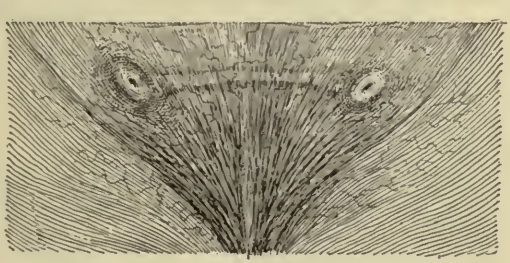


FIG. 81.—The trigone of the bladder with the ureteral orifices and the interureteric fold.

them. *Never* get any moisture in the eyepiece of the scope. This end is *not* watertight.

19. When difficulty is met in localizing the ureters, hypodermic injection of indigocarmin (0.06 gm.) will color the urine blue and enable the ureters to be seen, as they spout urine.

METHODS OF COLLECTING URINE FROM URETERS SEPARATELY

1. Ureteral catheterization.
2. Segregation.

Ureteral catheterization is much the best. It occasionally gives pain afterward, due to irritation of the ureter or passage of a small clot, but this is short lived and of no moment.

Segregation is the formation of an artificial division in the bladder and the exhaustion of the urine from each side of the partition by suction. It is not satisfactory and only used when ureteral catheterization is not practicable. The instruments used are:

1. Harris' method, where pressure by a bar against the anterior vaginal wall is used to make the partition.

2. Cathelin's or Luys' methods, where the partition is

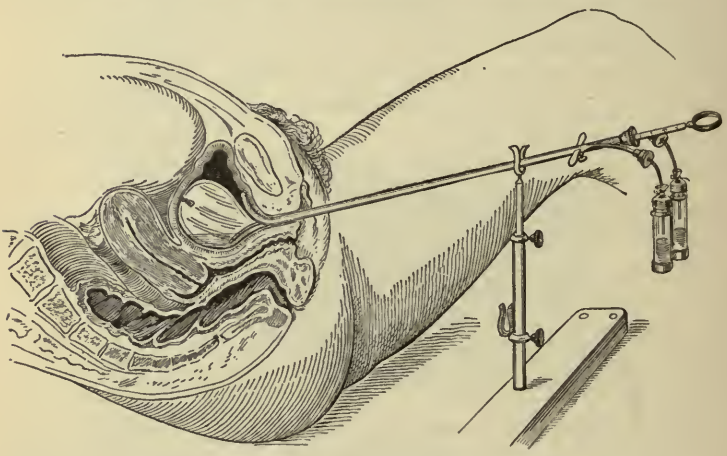


FIG. 82.—Luys's instrument for the intravesical separation of the two urines. (*B. C. Hirst.*)

formed of rubber, integral with the instrument inside the bladder. Luys' instrument is the most satisfactory.

Uses of a Ureteral Catheter.—1. To collect urine; (2) to diagnose stricture of ureter; (3) to diagnose stone in ureter (wax-covered tip); (4) to irrigate pelvis of kidney; (5) for *x*-ray work, to show position and course of ureter; (6) to make ureter prominent, in operations for cancer.

THE TOXEMIAS OF PREGNANCY

Kinds.—The *early*—seen in the first four months of pregnancy, characterized by normal or subnormal blood-pressure;

moderate or severe vomiting; and rarely any kidney breakdown.

The *late*—seen in the last five months of pregnancy; characterized by high blood-pressure; albuminuria; eye disturbance; convulsions, but rarely vomiting except incidentally.

Theories as to Cause.—*Early Toxemia.*—(1) Toxins due to syncytial hyperplasia; (2) failure of absorption of corpus luteum; the corpus luteum of pregnancy *increasing* in size until the third month and then the cessation of nausea and beginning absorption of the corpus luteum occurring synchronously.

Late Toxemia.—(1) Errors in fetal metabolism, causing a retention in the maternal system of a toxin which causes anemia of kidney with fatty infiltration (so-called kidney of pregnancy); (2) direct effects of increased intra-abdominal pressure; as in twins, hydramnios, etc.

The Toxemia of Early Pregnancy

VOMITING

Vomiting may be: (1) physiologic; (2) exaggerated or (3) pernicious.

The **normal vomiting** of pregnancy is most marked in the morning, though it may recur at irregular intervals throughout the day. It is annoying rather than distressing and the routine treatment is: (1) Light diet; (2) sodium bromid gr. 15 in camphor water, drams 2, four times daily; (3) hypodermic intramuscular injections of 1 mil soluble extract of corpus luteum once daily.

The **exaggerated vomiting** of pregnancy is marked increase over the normal. It is not uncommonly *reflex*, and search should be made for: (1) eroded cervix and (2), retroversion of the uterus—the two commonest causes of reflex vomiting, before instituting any treatment. Otherwise the treatment is as above.

The Use of Corpus Luteum Extract in Vomiting of Pregnancy.—This is based upon the author's theory that every

woman is constantly absorbing corpus luteum. When she becomes pregnant the corpus luteum of pregnancy does not absorb at once, but increases in size. When the remains of the preceding corpus luteum have disappeared, the vomiting begins due to the absence of further material. Synchronously with the resumption of absorption of the corpus luteum of pregnancy, at the third month, the nausea disappears. It is believed that this is not a coincidence, but cause and effect.

The soluble extract is given *intramuscularly* in doses of 1 mil every other day to 1 mil twice daily, depending upon the severity of the attack. Each mil equals 20 mg. of the dried substance. No effect is usually noted until after the fourth dose, when relief comes suddenly. Twelve doses are given in all, on the average. The method is on trial, but the author's results so far have been distinctly encouraging (111 cases; 99 successful). Mouth administration is not satisfactory, as the action of the corpus luteum extract is unfavorably influenced by digestion.

In severe cases, the extract can be given intravenously in doses of 2 mils (ampules.)

Pernicious Vomiting or Hyperemesis Gravidarum.—*Kinds.*

1. Neurotic.

2. Reflex—from anything causing pelvic congestion. Most commonly from (1) erosion of the cervix and (2) backward displacement of the uterus.

3. Toxemic.

Frequency.—It is more common in, or at least more frequently reported from, the United States and France than from Germany or England. About 65 per cent. of cases occur in multiparæ, and it is distinctly more dangerous in multiparæ than in primiparæ.

Pathologic Changes.—These are most marked in the liver and kidneys. Fatal cases, on autopsy, show diffuse hemorrhagic hepatitis; acute fatty degeneration in the center of the lobules, and even extensive necrosis of the liver. The kindeys show changes varying from the kidney of pregnancy (anemia with

fatty infiltration) to acute parenchymatous nephritis with grave degeneration.

Symptoms.—(1) Excessive and almost incessant vomiting and retching, irrespective of whether the stomach contains food or not; (2) elevation of pulse and temperature; (3) drying of all the mucous membranes; (4) jaundice; (5) emaciation. The rapid development of these symptoms usually points toward a toxemic type of vomiting; their slow development rather toward a reflex or even neurotic type. The high ammonia content of the urine (up to 40 per cent.) with low urea has been demonstrated to be due not to toxemia, but to an acidosis from starvation.

Treatment. 1. *Hygienic Treatment.*—This consists in giving the patient the best possible surroundings; insistence upon hospital care is much to be preferred. All causes of pelvic congestion, such as coitus, should be eliminated. Any craving for unusual articles of food may be gratified, provided the articles craved are reasonably digestible. Complete rest in bed, quiet, and freedom from visitors must be insisted upon.

Gynecologic Treatment.—Any condition in the pelvis which might cause vomiting from reflex irritation must be corrected. Erosion of the cervix should be treated with 8 per cent. (40 grains to the ounce) nitrate of silver solution, repeated in two days. A retroverted uterus should be replaced, in the knee-chest posture, and a pessary inserted.

Medical Treatment. 1. *Feeding.*—The stomach should be given an entire rest, except where special cravings exist, and all food given by the rectum. The best enemas are: liquid peptonoids or predigested beef two ounces and salt solution (0.7 per cent.) or sugar solution (glucose one and one-half ounces to two pints) two ounces, given every four hours. A nutritive enema should never exceed six ounces, and four is better. Peptonized milk or peptonized beef-tea or broth may be substituted, but the predigestion should be carried thirty to forty-five minutes.

Twice daily a high enema of salt or sugar solution one pint should be given to relieve the thirst.

Drugs.—Opium (gr. 1 extract) by suppository twice daily; bromids one dram in solution in each nutritive enema; chloral thirty grains in three ounces mucilage of acacia by enema, repeated once; adrenalin solution 1–1000, twenty drops three times daily by the mouth or five drops hypodermically.

The local anesthetics like cocain, B-eucain, menthol, etc. have little effect, and all the depressant drugs, like morphin and bromids, tend later to increase the vomiting.

Serum Treatment.—The administration of thirty to fifty mils of serum from a woman who has established tolerance to vomiting, on the principle that it contains some antitoxin, has met with slight if any success. The difficulties in obtaining a sufficient supply are obvious.

Hypodermic Injections of Corpus Luteum Extract.—The author has succeeded in curing six cases of pernicious vomiting, in all of whom the interruption of pregnancy had been seriously considered, by hypodermic intramuscular injections of 1 mil twice daily of soluble extract of corpus luteum. In desperate cases, the injections may be given intravenously.

Obstetric Treatment.—It is difficult to lay down a dogmatic rule as to when pregnancy is to be interrupted. If rectal feeding, and other treatment for one week has failed to control the vomiting; if the pulse runs persistently over 110; and if there develop hematemesis, jaundice, fever or marked albuminuria, the termination of pregnancy is required, but only after consultation.

Prognosis.—With proper treatment and the timely interruption of pregnancy, the mortality should be low. The chief danger is in waiting too long before interfering.

The Late Toxemia of Pregnancy

Types.—There are two distinct varieties: the *nephritic*—in which the kidneys fail—and the *hepatic*—in which the liver undergoes degeneration. The degeneration of the liver in

the late toxemia of pregnancy begins in the periphery of the lobule and spreads toward the center—the exact opposite of the same degeneration in the early toxemia. The hepatic type of the late toxemia is much the more dangerous.

Blood-pressure.—The earliest, most constant sign of toxemia in the latter half of pregnancy is a high and rising blood-

FIG. 83.—The "Tycos" blood-pressure apparatus. (*B. C. Hirst.*)

pressure. The pressure may be taken with either a mercury column or dial sphygmomanometer, the former being the better. The systolic pressure may be obtained by observing the oscillation of the column or needle, auscultation over the brachial artery at the elbow, or palpation of the radial pulse. The systolic pressure is the most important, although it is

wise always to read the diastolic as well, as too great a divergence between them is often an indication of myocarditis. The normal blood-pressure in pregnancy should average 118 to 125 mm., tending to rise slightly in the last month. A pressure of 125 to 150, unaccompanied by other symptoms need

FIG. 84.—Nicholson's blood-pressure apparatus. (*B. C. Hirst.*)

cause no alarm, but a pressure over 150, with a tendency to rise still higher, indicates prompt and active treatment.

Albuminuria.—If a trace of albumen be regarded as positive, 75 per cent., at least of pregnant women will show it.

A measurable amount of albumen will be found in approximately 6 per cent. In 10 per cent. of toxemic patients, the constitutional symptoms of headache, failing vision, somnolence, and epigastric pain will antedate the appearance of albumen.

The presence of albumen is best detected by boiling or nitric acid (Heller's test). As a small amount of albumen is not necessarily a cause for alarm, the more delicate tests are neither necessary nor desirable.

For quantitative tests, Esbach's picric acid method answers every purpose.

Urea estimation is unreliable. It is said that the normal urea output should be 16 to 24 grams a day. If this falls below ten grams, the outlook is said to be serious. This has not been borne out in practice, and the urea estimation in the toxemia of late pregnancy is not of great clinical value. For office work, the Doremus ureometer answers every purpose. It is employed as follows:

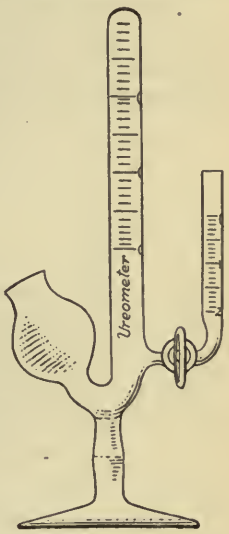


FIG. 85.—Doremus ureometer.

The normal amount of urea excreted in pregnancy is said to be from 1.5 to 2 per cent. (16 to 24 grams per diem). The Doremus apparatus consists of a two branched tube set upon a stand, the larger branch having a U bend, terminating in a large bulb. The smaller branch is separated from the larger by a stopcock. The large branch is filled with a 40 per cent. solution of caustic soda, to which 1 mil of bromin is added, forming a fresh solution of sodium hypobromite. The small branch is filled with urine and 1 mil is allowed to run through slowly, by turning the stopcock. The urea is decomposed, nitrogen is set free, and gathers at the top of the tube. The amount of nitrogen formed is read off from the scale marked up on the tube, each division representing 0.001 grams of urea to the mil of urine. The total amount in twenty-four hours can thus be calculated.

Nitrogen Partition.—This is represented by two rather intricate laboratory calculations. First the relation of urea to the

other nitrogens. Normally urea is about four-fifths of the total nitrogen in the urine; in toxemia it is said to be reduced to one-half or less.

Secondly the ratio of ammonia nitrogen to the total nitrogen content of the urine. This is normally 3 to 5 per cent. but may rise, in toxemia, to as high as 50 per cent.

These tests are for the trained chemist, and their value to the practical physician is almost negligible.

Urea and Urea Nitrogen in the Blood.—In many cases the urea and urea nitrogen count of the blood is of the greatest diagnostic importance, particularly those cases showing kidney breakdown in the early half of pregnancy, in whom a previous nephritis has been proved or is suspected. For the following description of the method, the author is indebted to Dr. A. E. Rubenstone, Pathologist of Mt. Sinai Hospital, Philadelphia.

The estimation of urea and urea nitrogen in the blood had been found an excellent means of determining the functional activity of the kidneys especially in chronic nephritis and is of great import in prognosis particularly when the question of operation or terminating pregnancy arises. The normal amount of urea in the blood on an ordinary mixed diet is between .02 and .035 per cent., nearly half of this amount being urea nitrogen. When the functional activities of the kidneys are impaired this substance is retained in the blood and tissues in greater quantities than normally present and the degree of retention will depend on the extent of the renal involvement. In nephritis values up to .05 to .07 per cent. of urea are obtained while in uremia up to .2 per cent is recorded. Obviously the greater the retention of urea the more unfavorable the prognosis, those cases showing more than .1 per cent. of urea usually terminating fatally.

Considering the ease with which the estimation of blood urea may be carried out with the following technic and since it serves as an excellent index of the amount of nitrogenous

retention it may be instituted as a routine diagnostic and prognostic procedure.

This test depends on utilizing urease, which is an enzyme present in extract of soy bean to decompose urea-forming ammonia which is carefully estimated by titration with an acid and the amount of urea calculated.

Urease, discovered by Takeuchi in 1909 in the watery extract of the soy bean, converts urea into ammonium carbonate. It acts at room temperature and forms ammonia from nothing except urea and is not interfered with by glucose or anything else likely to be encountered in physiologic fluids. The enzyme is most active in the form of a dry powder which is readily soluble in water and for the test a fresh 10 per cent. solution is utilized.

Three mil of fresh blood measured with an accurate pipet are run into a 100 mil test-tube containing 1 mil of 3 per cent. potassium citrate to prevent clotting, .5 mil of the urease solution and 2 or 3 drops of caprylic alcohol are added. After ten minutes, during which the enzyme decomposes the urea, 5 mil of saturated potassium carbonate is added, and the ammonia is driven over by aëration into 15 mil of hundredth normal hydrochloric acid which has been previously placed in a test-tube of 100 mil capacity and connected with rubber stopper and tubing. (The technic of aëration is essentially that of Folin.) A half hour of rapid aëration will surely drive all the ammonia from the blood urease solution into the acid, which also should have a few drops of caprylic alcohol to prevent foaming. To determine the amount of ammonia driven over into the acid simply titrate the acidizing alazarin as indicator and hundredth normal NaOH and each mil of acid neutralized by the ammonia is equivalent to .01 per cent. of urea or .00467 per cent. of urea nitrogen.

Urea and ammonia nitrogen in the urine can be determined just as rapidly with urease with but slight difference in details in technic.

It can easily be understood that a patient with toxemia of pregnancy might urgently need the termination of pregnancy if the blood urea count was dangerously high even though other clinical symptoms had not yet appeared to emphasize the need for interference.

Pathologic changes in the kidney are: (1) The kidney of pregnancy—anemia of the kidney with fatty infiltration—and (2) acute or chronic nephritis. Kidney of pregnancy is rarely seen in the early months of pregnancy; nephritis may appear at any time. The following differential diagnosis is more theoretical than practical.

DIFFERENTIAL DIAGNOSIS BETWEEN KIDNEY OF PREGNANCY AND TRUE NEPHRITIS

Kidney of Pregnancy	*Nephritis*
1. No previous history of kidney trouble.	1. May be present.
2. Appears late in pregnancy.	2. Appears early.
3. Urine increased at first but liable to sudden diminution; low specific gravity.	3. Same as in kidney of pregnancy.
4. Albumin present and liable to sudden increase.	4. Same as in kidney of pregnancy.
5. Casts late if at all.	5. Casts early and abundant.
6. Albuminuric retinitis absent.	6. Albuminuric retinitis often present.
7. Clears up after delivery.	7. Likely to persist after delivery.
8. Fatal cases show anemia of kidney and fatty infiltration.	8. Fatal cases show inflammatory changes and degeneration.

Treatment of Albuminuria in Pregnancy.—When albumen is discovered, in measurable amounts, in the urine of a pregnant woman, the urine should be filtered and re-examined, to exclude contamination by leukorrheal discharge. Catheterization is not necessary. If the albumen still is found, the following treatment is instituted.

(1) Reduce the diet, eliminating the nitrogenous food, such as red meats, peas, beans, corn and tomatoes.

(2) Prescribe large amounts (12 to 15 glasses daily), of water.

(3) Basham's mixture two drams four times daily.

(4) Bowels kept loose enough for two semiliquid movements a day.

(5) Make quantitative tests for albumen in the urine every other day.

(6) Take readings of blood-pressure every other day.

(7) Reduce exercise, and avoid exposure to cold or wet.

If in spite of this treatment the urine diminishes in quantity; or the albumen increases; or casts appear; or the blood-pressure continues to rise:

(1) The patient should be put to bed.

(2) Her diet should be milk only—or milk soups, milk toast, etc., to vary the monotony.

(3) The bowels kept liquid by citrate of magnesia—given *flat*—or magnesium sulphate or similar hydragogue cathartic.

(4) She should be sweated for half an hour twice daily by a hot pack or better by a steam bath, given in a portable cabinet.

(5) Examinations of urine and blood-pressure should be daily.

A *hot pack* is given by wrapping each leg in a blanket wrung out of very hot water, the body in a third, and on top of this piling dry coverings.

It can be made more efficient by putting under the dry blankets, six bricks, heated uncomfortably hot to the hand, each brick wrapped in an alcohol soaked towel. The hot pack is not nearly so efficient as the steam or vapor bath.

Steam or Vapor Bath.—Special cabinets are on the market for this and are best used. An efficient substitute can be made by taking half of three barrel hoops, and binding them at intervals to a curtain pole or broom stick. This framework is put over the patient, who is lying in bed between blankets, and a tent is built over her with blankets, leaving only her head exposed, and made as airtight as possible. Steam from a kettle of boiling water is led under this, by a rubber tube—

the tube being tied to the ridge-pole of the tent in such a position that the patient cannot be scalded. This is a most efficient method, and should always be used in preference to the hot pack.

If, in spite of this treatment, the patient does not improve, pregnancy should be terminated on the following indications:

FIG. 86.—Portable sweat cabinet. During the bath, the temperature under the tent averages 128° F. (*B. C. Hirst.*)

(1) Sudden or steady increase in albumen.

(2) Sudden or steady decrease in urine.

(3) Sudden or steady rise in blood-pressure.

(4) The appearance of the premonitory signs of eclampsia —headache, failing vision with black specks before the eyes (muscæ volitantes); epigastric pains; restlessness.

The appearance of defective vision, black specks before the eyes, or blindness always indicates the prompt interrup-

tion of pregnancy. If neglected, the patient, if she survives, may be permanently blind.

Prognosis.—In the majority of cases the toxemia either clears up entirely or eclampsia can be averted by the timely interruption of pregnancy. If a patient has had to be treated during her pregnancy in the manner just described, and has recovered without the interruption of pregnancy, labor should be induced two weeks ahead of time to avoid a fulminant recurrence, and in the interval she should be closely watched.

ECLAMPSIA

Causes of Convulsions.—Most frequently due to toxemia. Other causes are hysteria, epilepsy, brain tumor and in 5 per cent. of cases reflex from the gastro-intestinal tract (indigestion, fecal impaction or tapeworm). The name eclampsia has by usage been restricted to mean those convulsions due to toxemia.

Cause of Eclampsia.—The exact cause is unknown. It is supposed to be due to toxins of fetal source contaminating the maternal blood. What these toxins are is not known. They affect the liver and kidneys of the mother. The theories of toxins from the thyroid, parathyroid, suprarenal bodies and pituitary and mammary glands have as yet no proof to support them. The actual convulsions are said to be due to acute cerebral anemia, or direct irritation of the central nervous system.

Frequency.—Eclampsia occurs once in about three hundred pregnancies. It is most frequent in primiparæ in multiple and in illegitimate pregnancies. The convulsions begin most frequently in labor, next in pregnancy and least frequently in the puerperium.

The outlook is most favorable if convulsions appear before delivery and cease after delivery; not so favorable if convulsions appear before delivery and persist afterward; and least favorable when the convulsions do not appear until after delivery, although some published statistics seem to contradict this latter statement.

Number of convulsions does not necessarily indicate the severity of the attack. Cases have been fatal with only one convulsion, and others have recovered after more than two hundred and fifty.

Blood-pressure is almost invariably high; the average being 190 mm. In two cases the author has seen pressures of over 420 and 400 respectively (both with recovery). It is said that true eclamptic convulsions can occur with a low blood-pressure (130 or less) but as 5 per cent. of the cases of convulsions are of gastro-intestinal origin, they may be of this type.

Premonitory signs are: (1) High blood-pressure; (2) failing vision with muscæ volitantes; (3) headache; (4) epigastric pain (a very constant symptom); (5) somnolence, or more often restlessness.

The **eclamptic attack** begins with a stare; there is then a progressive *clonic* convulsion of the face, neck, arms, body but rarely legs; consciousness is lost with each seizure for increasing periods, until finally coma is unbroken; the temperature rises (a beginning fall is often the first sign of improvement). The convulsions last about thirty to sixty seconds and look much more alarming than they really are.

Labor often begins spontaneously when the convulsions appear, due in all probability partly to the cyanosis (excess of CO_2) accompanying the convulsions and partly to the active treatment employed. In the absence of any obstruction to delivery, labor is usually more rapid than normal.

The patient may seem conscious between the convulsions, and answer questions, but she will have no recollection of anything that occurs.

Differential diagnosis of eclampsia from **hysteria** or **epilepsy** or **apoplexy** is easily made. The chief points of difference are high blood-pressure, albuminuria, absence of localized palsies or convulsions, and the tendency of the eclamptic to bite her tongue.

If the urine of an eclamptic patient is boiled, it will usually turn almost or entirely solid.

Prognosis.—The average mortality of eclampsia, for the mother is close to 20 per cent. Small series with a lower mortality have been reported. Great rapidity of the pulse and high fever occur in the worst cases only. Prognosis should always be guarded, as apparently favorable cases often succumb. In favorable cases the kidneys usually clear up entirely. The quantity of urine first increases, often to one hundred ounces or more in twenty-four hours; then the casts, if any, disappear; then the albumen; and the last step is the return of blood-pressure to normal. The mortality to the child is about 50 per cent.

Causes of Death.—(1) Edema of lungs or brain; (2) apoplexy; (3) uremia; (4) acute yellow atrophy of liver; (5) heart-failure.

Pathological Findings.—Nephritis with degeneration of epithelium; liver degeneration varying from minute capillary thrombi to extensive fatty degeneration; emboli of liver-cells in all important organs; emboli of giant polynuclear cells from the placental villi to the lungs.

Treatment.—Preventive treatment is that described under the treatment of albuminuria.

Active Treatment.—Every case of eclampsia should be treated as a severe one, and no precautions should be omitted in deference to the apparently mild case. It is not uncommon for convulsions to cease, after a short while, and then to recur with unusual violence after the lapse of a few hours.

Anesthesia.—The only anesthetics available are ether and chloroform. Their only value is in the prevention of convulsions, as during a convulsion the patient does not breathe and cannot inhale them; or in operative measures to secure delivery—although here the patient is frequently so comatose that no anesthesia is necessary. Chloroform may, by prolonged administration, produce the same liver degeneration as eclampsia; ether is a usually severe irritant to the kidneys. When required, however, ether is the safer.

Reduction of blood-pressure may be secured by: (1) Hypoder-

mic injection of 15 minims of fluidextract of veratrum viride and repetition of a dose of five minims every hour until the pulse softens; (2) nitroglycerin gr. $\frac{1}{50}$ hypodermically and repeat in an hour—of very questionable value; (3) inhalations of amyl nitrite—also doubtful; (4) rupture of the membranes, producing an average fall of 90 mm. but not to be done prior to the eighth month, unless it is desired to induce labor; (5) venesection—removing 16 to 20 ounces—probably the most valuable of all. Purgation and sweating also tend to reduce blood-pressure, but this action is merely incidental to their chief one of elimination. Reduction of blood-pressure with amelioration of the other symptoms is a favorable sign; reduction of blood-pressure with aggravation of the other symptoms is a sign of impending death.

Hypodermoclysis.—A pint of sterile water (*not* salt solution, on account of the deleterious action of salt on the kidneys) may be injected under the breast every eight hours. It aids greatly in the establishment of free sweating, but the second dose should not be given unless in the interval free sweating and purging has begun, or there is danger of edema of the lungs. Administration of the fluid intravenously is not advisable, nor administration by high enema.

Purgation.—This is best done by washing out the stomach and introducing through the tube two ounces of castor oil and four drops of croton oil. This mixture should be warmed, so that it will run freely through the tube.

Croton oil four drops in a teaspoonful of sweet oil, given on the back of the tongue, is liable to be vomited promptly. The oil given through the stomach tube is rarely vomited.

If the patient can swallow, two drams of concentrated magnesium sulphate solution may be given every fifteen minutes, until the bowels begin to move. Huge doses are usually required, eight or ten ounces being not unusual.

Elaterium gr. $\frac{1}{4}$, repeated every hour until the bowels move, may be substituted, but does not act as well.

Sweating is best done by the vapor bath (steam cabinet)

as described in the treatment of albuminuria. The bath is given for thirty minutes in every four hours (four hours from the beginning of one bath to the beginning of the next). An ice-cap is placed upon the patient's head, and if she is able to swallow, a glass or two of water during the bath aids materially in starting the sweating.

A *hot pack* is not nearly so efficient as the vapor bath. If used, the interval is the same. Sweating by drugs, such as pilocarpin, is to be condemned.

Venesection is one of the most valuable methods of treatment. It should be reserved for those cases whose blood-pressure is over 150. The extreme restlessness, and cerebral edema, yield more quickly to venesection than any single method of treatment, and it is not uncommon for the convulsions to cease, or be markedly diminished in frequency, immediately after the bleeding. Sixteen to twenty ounces should be taken, and repetition of the bleeding is indicated by subsequent rise in blood-pressure. Supplementary bleeding should not exceed eight ounces.

Induction of labor, is ordinarily not required, other than rupture of the membranes, if the patient is past the eighth month. The violence of the purging and sweating are usually enough to start labor spontaneously. Should anything more than rupture of the membranes be desired, bougies or a boiled rectal tube should be passed through the cervix, and no prolonged or violent operative procedures be attempted.

Outline of Routine Treatment.—The following routine treatment for the average case will be found useful, and will not often need variation:

(1) Prevent the patient from biting her tongue by a suitable gag—a handkerchief or towel passed between the teeth like a bit and bridle is the best.

(2) Restrain during the convulsions.

(3) Avert convulsion if possible, by a few breaths of ether, when the convulsion is seen to be imminent.

(4) Wash out the stomach, and through the stomach-tube

pour, warmed, two ounces of castor oil and four drops of croton oil, or give two drams of saturated solution of magnesium sulphate every fifteen minutes until bowels move.

(5) Reduce blood-pressure by rupture of membranes, if past eighth month, or venesection (16 to 20 ounces) if pressure is over 150 mm.

(6) Sweat for thirty minutes in each four hours, in a steam cabinet or hot pack.

(7) Give one pint of sterile water under breast. Do not repeat unless patient sweats freely.

FIG. 87.—Prevention of tongue injury by use of a gag, made of a twisted handkerchief, used like a bit, and tied behind the neck.

(8) Ordinarily let the labor alone and do not attempt rapid delivery.

Treatment Other Than Routine. (1) *Morphin.*—This, known as the Veit or Stroganov treatment, has an element of danger. It is well borne in parenchymatous nephritis, and very badly borne in interstitial nephritis. As 10 per cent. of eclamptics show interstitial nephritis, the risk is too great to be disregarded. If it is used, morphin is given hypodermically, without atropin, in doses of ½ grain, repeated every hour for

two or three doses. Veit has given three grains in six hours, and four and one-half grains in twenty-four hours. The morphin also hinders free elimination. It should be reserved for those cases whose convulsions are extremely violent and not controlled by venesection, or the cases of extreme restlessness and mania.

Pilocarpin.—This, known as the Edinboro treatment, is to be condemned except under special indications. Its use strongly predisposes to edema of the lungs, and it has the highest mortality of any treatment for eclampsia.

It may be used, in a single dose of $\frac{1}{6}$ grain hypodermically, in those patients, who do not respond to other treatment, in the hope that sweating may thus be started.

Chloral thirty to sixty grains are given at a dose, and as much as three drams in twenty-four hours. It is given in mucilage of acacia—three ounces—by enema. It has a record of 3.5 per cent. mortality in 114 cases, a record that entitles it to serious consideration.

Thyroid and *parathyroid extract*, the use of which is based upon animal experimentation, have not given much, if any success, and are not worth while.

Hirudin has been recommended, intravenously, to prevent if possible the capillary thromboses of the liver and kidneys. It is of doubtful value, and has the serious objection of predisposing to postpartum hemorrhage, from the reduced coagulability of the blood.

Other methods recommended are: (1) Lumbar puncture; (2) decapsulation of kidneys; (3) pumping or even amputation of the breasts—based upon the erroneous theory of a mammary cause for the convulsions. All these methods are more or less fantastic, and have not received more than passing notice.

Forcible delivery (accouchement forcé) has an increasing number of advocates. The safer plan to adopt is a middle course between the enthusiasts who always do it and the ultra-conservatives who never do it. As in most cases the convulsions cease or are at least greatly reduced in number, it would

seem the part of wisdom to empty the uterus without delay. The objection is *surgical shock*. These patients are poor surgical risks, and do not stand operation as well as normal patients. They will, however, show much less shock if operated upon after twelve or twenty-four hours of elimination, than if forcibly delivered at once. Large statistics have been collected to show the more favorable results of immediate forcible delivery, and equally large ones to show the better results of conservative over operative treatment. The question is still an open one, with the trend of opinion toward rapid delivery, each case, however, being judged upon its own merits and indiscriminate operation avoided.

Methods.—If the patient is in labor, the cervix well dilated and the head engaged, delivery by forceps is indicated. The main problem is found in the patients not in labor, without effacement of the cervix. Here hydrostatic or instrumental dilatation of the cervix with delivery by forceps or version give the least risk, provided sufficient time is taken for delivery. Vaginal cesarean section (anterior vaginal hysterotomy) offers a rapid method, but one with considerable danger of tearing the bladder, if it is employed after seven and a half months.

Abdominal cesarean section is indicated in any case where there exists any obstacle to easy delivery, or where the patient's condition is such that very rapid delivery is essential with a minimum of shock.

Stimulation.—Many eclamptics with normal delivery and very many with forcible delivery require stimulation. A satisfactory routine method is: (1) Digalen 10 drops or digipuratum 1 ampule hypodermically every three hours; (2) strychnia sulph. gr. $\frac{1}{20}$ hypodermically every three hours alternating with digitalis; (3) camphorated oil hypodermically 20 minims and repeat every two hours if needed; (4) elevate foot of bed 12 inches; (4) external heat by hot-water bags or by electric cabinet.

CHAPTER X

THE PREMATURE TERMINATION OF PREGNANCY (ABORTION. MISCARRIAGE. PREMATURE LABOR). EXTRA-UTERINE PREGNANCY

When the expulsion of the ovum occurs prior to the fourth month, it is called *abortion*; from the fourth to the seventh month, *miscarriage*; and from the seventh month to term, *premature labor*.

ABORTION

Frequency.—The frequency of abortion is about 20 per cent. or one to every four or five completed pregnancies. The most common period is between the second and third months.

Causes.—The cause of an isolated case of abortion is often difficult to determine, but it is usually due to overexertion or some physical shock. The commonest causes of repeated abortions are: (1) Syphilis, responsible for about 85 per cent.; (2) backward displacement of the uterus; (3) pelvic inflammation—most commonly endometritis; (4) irritable uterus—one extraordinarily sensitive to external shock; (5) chorea. Many other causes could be cited responsible for isolated cases, but the vast majority are accounted for by the above. Some women, on the other hand, present the greatest resistance to shocks or causes ample to produce abortion; even the roughest treatment or severe accidents fail to disturb their pregnancy.

Classification.—Abortion may be threatened or inevitable; the inevitable may be complete or incomplete.

Symptoms of Threatened Abortion.—Cramp-like pains in the lower abdomen and hemorrhage. The hemorrhage is usually in the form of clots and is rarely excessive. On examination, the patient presents the confirmatory signs of pregnancy and blood is issuing from the cervix. The expulsion

of the ovum may be immediate or it may be delayed for many days or even weeks.

Diagnosis of threatened abortion is made upon the above symptoms. They may be closely simulated by efforts of the uterus to expel a fibroid polyp.

Treatment of threatened abortion is absolute rest in bed, no local treatment such as douches; avoidance of active cathartics; opium suppositories, gr. 1, twice daily and a teaspoonful of the fluidextract of viburnum prunifolium three times a day. If this latter is nauseating, gr. v of the solid extract of viburnum prunifolium may be substituted, in addition to the opium in the suppositories. If the symptoms subside, the patient should be kept in bed for a week after all bleeding has ceased, to guard against recurrence. If actual abortion does not take place, the threatening symptoms will usually begin to subside within forty-eight hours of the beginning of treatment.

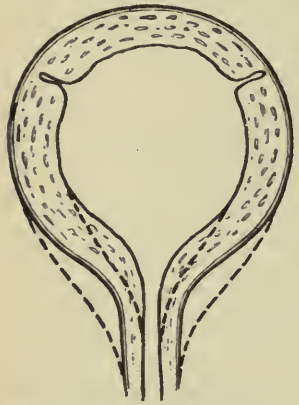


FIG. 88.—Tarnier's sign of inevitable abortion.

Diagnosis of Inevitable Abortion.—Continued pain, continued hemorrhage, dilatation of the cervix and the presentation of portions of the ovum mean usually inevitable abortion.

Tarnier's sign is due to the dilatation of the cervix. As the cervix dilates from above downward, the cervico-uterine angle, where the uterine body bulges sharply outward at the level of the internal os, becomes a more gentle curve. This is apparent even before there is any dilatation of the external os. When an abortion is seen to be inevitable, and the os is not much dilated, but bleeding is free, the bleeding may be checked by packing the vagina tightly with sterile or iodoform gauze. When the gauze is removed twelve hours later, the

ovum will often be found adhering to the upper layers of the gauze or presenting through the cervix, whence it can be easily removed by placental forceps. If it is not discharged, the treatment may be expectant or active.

Expectant Treatment.—The patient is given fluidextract of ergot, thirty drops, three times daily, but this is liable to cause retention instead of expulsion of the ovum, by contracting the cervix as well. Pituitrin ½ ampule hypodermically and repeated in two hours if needed is better. If a foul odor to the discharge appears or free bleeding begins, the waiting plan must be abandoned and the uterus evacuated. As a rule the expectant treatment is not to be recommended. In only 13 per cent. is the expulsion of the ovum complete, and the other 87 per cent. will in the end require the instrumental evacuation of the uterus.

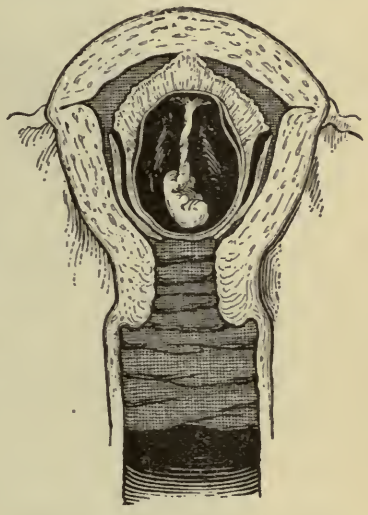


FIG. 89.—Packing for abortion.

Active Treatment.—When the os is sufficiently dilated, the ovum can be evacuated by the finger (possible only when the ovum is in the cervix or lower uterine segment) or by Emmet curetment forceps. If the bleeding is profuse and the os not sufficiently dilated, it may be controlled by packing, or the cervical canal may be instrumentally dilated and the ovum extracted. The curet is rarely needed, and if used should be a dull one. Extreme gentleness is needed to avoid perforation of the uterus. In nulliparæ, an anesthetic is usually required; but the dilatation and evacuation may usually be done in multiparæ without anesthesia. In either case, it is much easier

with the patient on a table than across the bed. If the patient has lost a great deal of blood, it is wiser to pack the uterus and vagina for twelve or twenty-four hours, and in all cases the

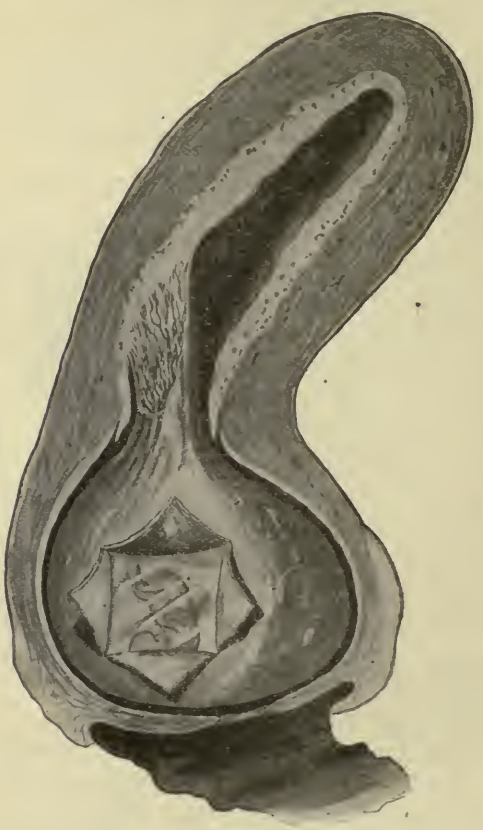


FIG. 90.—Cervical abortion, the ovum still in the reflexa and the placenta drawn out, but adherent at its base. This is the only type of abortion where the ovum can be removed with the finger. (*De Lee.*)

patient should be given one dram of fluidextract of ergot by mouth or one ampule of aseptic ergot hypodermically, when the operation is completed. The uterus should be irrigated

after the evacuation and again after the packing has been removed.

After-treatment.—The patient is kept in bed for ten days. Diet is light and the bowels should be kept well opened. No douching is necessary unless the patient is infected, when she is treated as any ordinary case of puerperal infection.

The infection is of two types—the spontaneous abortion due to sapremia: the criminal abortion either sapremic or more likely streptococcic and hence much more serious. The simple evacuation of the uterus and one or two intra-uterine douches will cure the former, the latter is always serious and sometimes fatal.

Diagnosis of Complete or Incomplete Abortion.—If the mass expelled from the uterus has been saved for the physician's inspection, it should be floated out in water and examined to determine how much of the chorion if any, is missing. This is often impossible. In these cases the diagnosis must rest upon the degree of dilatation of the *internal* os. If this is closed we may assume that abortion is complete or only threatened and in either case the patient can be treated expectantly. If the os is open, and the uterine cavity can be easily palpated, abortion is incomplete and the evacuation of the uterus is indicated. In doubtful cases, the appearance of lactation may be of value in clearing up the diagnosis.

While the bleeding of a threatened abortion is not dangerous, the bleeding from an incomplete abortion may be very serious and even fatal. These cases of incomplete abortion should have the uterus and vagina packed after the evacuation, if the bleeding has been severe, as a precautionary measure.

Missed Abortion.—Rarely an abortion is threatened, the fetus dies, the symptoms subside and the ovum is retained in the uterus for a varying period, even years. No treatment is indicated unless the symptoms of abortion recur or the patient shows signs of infection, when the uterus must be emptied.

As in the minds of many patients the word abortion is synonymous with criminal abortion, they will often resent the use of

the word. In all cases it is better to speak of the condition as miscarriage, as that is the term with which they are familiar.

MISCARRIAGE

Miscarriage differs from abortion in the time of occurrence (fourth to seventh month); the product of conception is rarely thrown off entire, but usually the membranes rupture, the fetus is born and the placenta is likely to be retained. The pain is greater and more like true labor pain and the bleeding less. The classification, the symptoms and the treatment of threatened miscarriage are the same as abortion. For removing the tightly adherent placenta from the uterus, the hand is often better than curet or placental forceps. Occasionally the ovum is cast off entire, without rupture of the membranes

PREMATURE LABOR

Premature labor is caused by many of the causes of abortion and is the rule in multiple pregnancies. It differs in no way from labor at term except that it is shorter and easier, and that there is greater likelihood of adherent placenta. It is managed as labor at term.

EXTRA-UTERINE PREGNANCY (ECTOPIC GESTATION, TUBAL GESTATION, TUBAL PREGNANCY)

This means the arrest and development of the fertilized ovum at some point other than the uterine cavity, most often in the outer third of the fallopian tube. The ovum may lodge anywhere from the peritoneal cavity to the interstitial portion of the fallopian tube, in the uterine cornu.

Classifications.—The kinds of extra-uterine pregnancy are the (*a*) *tubal*; (*b*) *ovarian* and (*c*) *abdominal* which may be primary or secondary; and combinations, such as the tubo-uterine or interstitial or cornual pregnancy; tubo-ovarian pregnancy, etc.

Cause.—The cause of extra-uterine pregnancy is anything which prevents the normal progress of the ovum along the

tube to the uterine cavity; usually adhesions in or around the tube or the loss of the cilia of the tubal mucous membrane, due to a preëxistent salpingitis. Often no cause can be demonstrated.

Frequency is said to be one in 500 cases, and most often between twenty and thirty years. Tubal pregnancy is by far the commonest. Ovarian pregnancy is exceedingly rare. Primary abdominal pregnancy is also very rare but secondary abdominal pregnancy, where the embryo was originally in the tube, but escaped into the abdominal cavity and there con-

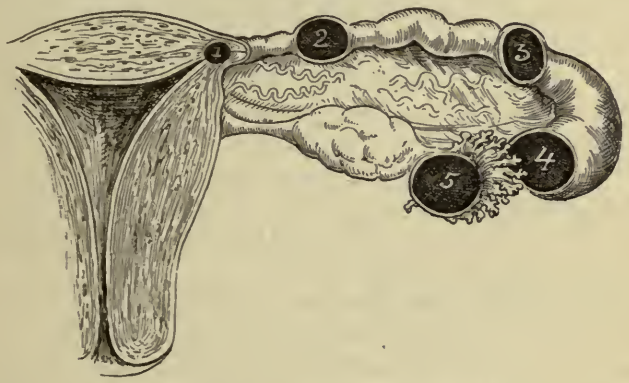


FIG. 91.—The possible sites of extra-uterine pregnancy: 1, Cornual or interstitial; 2, tubal in the isthmus; 3, tubal; 4, and 5 ampullar. Ovarian and primary abdominal pregnancy are exceedingly rare. (*Gilliam.*)

tinued its development for some time, has often occurred. In such a case the child may die at the time of its extrusion into the abdominal cavity, and be retained as a lithopedion for an indefinite time (56 years in one case); or it may partially absorb and the bones ulcerate through into the bowel or bladder; or it may continue its development until term, or past it, and be delivered alive by abdominal section.

Development.—In the tube the ovum behaves much as it does in the uterus. It burrows into the mucosa; this is imperfectly transformed into decidua and the chorion and amnion

develop as in normal pregnancy. Decidua is also formed in the uterine cavity, not as thick as in normal pregnancy. This decidua after the death or removal of the embryo is cast off, but sometimes must be removed by curetment, as it may become necrotic and cause sapremia, or may be a cause of bleeding.

Terminations.—Most commonly *tubal abortion*, or extrusion of the ovum through the dilated fimbriated extremity of the tube, with more or less severe hemorrhage, at about the sixth to tenth week of pregnancy. Next in frequency, *erosion* of the tubal wall (the so-called rupture) with severe internal hemorrhage; erosion of the tube with hemorrhage into the layers of the broad ligament; the conversion of the fetus into a lithopedion or calcification of the fetus; rarely death of the embryo and complete resolution. A tubo-uterine or interstitial pregnancy may make its way into the uterine cavity and progress normally to term and very rarely a tubal pregnancy may develop to term. Tubal pregnancy not infrequently occurs twice in the same individual. Rarely combined extra-uterine and intra-uterine pregnancy have been found.

Clinical History and Symptoms.—The patient has usually had children before, but the last some years previously. She misses one or two periods, which then return as irregular bleeding. At the same time occurs violent stabbing pain in the lower abdomen, severe enough to make her faint, and when she recovers consciousness, she is nauseated. The pain recurs in paroxysms, increasing in frequency and severity, but the interval between them is free from pain. Finally after one of these attacks of pain, the symptoms of internal hemorrhage appear. Frequently, however, this entire history may be negative, and the first symptom is a violent attack of pain with the signs of internal hemorrhage. There is often a discharge of decidua, from the uterus, described by the patient as "a piece of flesh, different from a blood-clot;" but no ovum is discharged, except in the rare instances when there is a combined intra- and extra-uterine pregnancy. There is a slight eleva-

tion of temperature, averaging 99.5° F. and a leukocytosis of 12,000 to 14,000. On vaginal examination, the patient presents confirmatory signs of pregnancy, the uterus not so large as one would expect to find it, and behind it a pelvic mass, extremely sensitive to the touch. The average time of rupture or tubal abortion is from the sixth to tenth week.

Diagnosis and Differential Diagnosis.—The diagnosis between the different varieties of extra-uterine pregnancy is made by operation as the clinical history and symptoms of the tubal, ovarian and abdominal varieties, are practically identical. The differential diagnosis from conditions closely resembling it may be of extreme difficulty. Two conditions that are practically indistinguishable from it are: (1) hemorrhage from a ruptured varicose vein in the broad ligament and (2) severe hemorrhage from the wall of a ruptured graafian follicle. Others in which a mistake is excusable are: (3) Acute salpingitis with or without coincident intra-uterine pregnancy; (4) ovarian cyst twisted on its pedicle; (5) appendicitis with or without coincident intra-uterine pregnancy.

In salpingitis there should be a leukorrheal discharge; higher fever; higher leukocyte count; no decidua passed; less sensitive mass; occasionally bilateral. The twisted ovarian cyst would be spherical in shape; lower temperature (shock); lower leukocyte count, no decidua. In appendicitis the point of tenderness would be over McBurney's point; higher fever, higher leukocyte count, no decidua; absence of a pelvic mass.

The difference is not so clear in practice. *Acetonuria*, said to be pathognomonic of internal hemorrhage, has been proved of no value as a diagnostic aid, being frequently found in pyosalpinx. In all cases in which a diagnosis of extra-uterine pregnancy is justifiable, the diagnosis should be made and acted upon. All the above require abdominal operation, and the only mistake is that of a possibly unnecessary hurried operation. A common but unjustifiable error in diagnosis is to mistake extra-uterine pregnancy for an incomplete operation. In cases of abdominal pregnancy, past the sixth month of

development, the *x*-ray will often afford a means of clearing up the diagnosis between extra-uterine pregnancy and other abdominal tumors.

Treatment is abdominal section as soon as the diagnosis is made. The vaginal route is not advisable. After as complete a preparation as possible under the circumstances, the abdomen is opened in the middle line, under general or local anesthesia. When the peritoneum is reached, its color is dark slate, if the tube is ruptured, from the clotted blood underneath. When the peritoneum is opened, the blood gushes forth in large quantity. No attention should be paid to it. The affected tube and ovary should be brought up into the wound, ligated and removed. The blood-clots are removed from the abdomen best by irrigation with sterile water or salt solution. The abdomen is closed without drainage. Rapidity of operation is essential. The need for rapidity is over, however, as soon as the blood supply of the affected tube has been controlled. Any intravenous stimulation or transfusion can be done on the table, during the operation. The expectant plan of treatment, of waiting until the patient has recovered from shock before operation, is not to be recommended. Occasionally these patients will not rally from shock but will bleed to death, and nothing is gained by delaying operation.

When the pregnancy has progressed, as it occasionally does, to the latter months, the danger of rupture is small and the operator is justified in waiting till the child is viable. If the child is alive, in these cases, often extreme difficulty will be found in controlling the bleeding from the placental site, and packing will usually be required. In cases where the child is dead and has been long retained, the placenta, blood-clots and decidua are very putrescible, and drainage is uniformly required. When the tube has ruptured into the layers of the broad ligament, and the patient has recovered from the immediate shock, the resulting hematoma is best evacuated by incision through the vaginal vault. Active stimulation is the rule in all bad cases. Salt solution intravenously (2500 mils

or more) is required. The common mistake is in giving too little. Intravenous transfusion of blood (500 to 750 mils); digalen ℥x or digipuratum (1) ampule every three hours hypodermically; strychnin sulph., gr. 1/20 every three hours hypodermically; oxygen for a few hours if very desperate; and external heat with bandaged extremities.

Prognosis.—Without operation 66 per cent. succumb to internal hemorrhage. Of the remaining 34 per cent. a large proportion are invalids or ultimately lose their lives from complications directly a result of the extra-uterine pregnancy. (suppurating pelvic hematoma, etc.). With abdominal section, the mortality should be very small (1 per cent. or less), if seen in time, and few, if any, cases are too desperate for operation. A few cases will first rally and then die of acute anemia, in spite of stimulation.

Pregnancy in one horn of an uterus unicornis or bicornis sometimes occurs. It cannot usually be diagnosed from tubal pregnancy and its complications and treatment are the same. It will probably rupture at the cornu of the uterus, but later in pregnancy than the tubal variety. The ovum may be expelled through the cervix, as in ordinary abortion.

A true cornual pregnancy may either rupture at the third or fourth month, or more likely spontaneously move into the uterine cavity and continue to term.

It is not wise to remove both fallopian tubes, unless both are diseased. While repeated ectopic is a risk, if the other tube be left, many more patients will become normally pregnant and be delivered at term.

CHAPTER XI

DYSTOCIA

A difficult labor may be either *delayed* or *obstructed*. The commonest causes of *delayed labor* are: (1) Inertia uteri; (2) rigid cervix; (3) breech presentations; (4) twins. The commonest causes of *obstructed labor* are: (1) Contracted pelvis; (2) overgrowth of fetus; (3) hydrocephalus; (4) obstruction due to pelvic tumors; (5) transverse or other malposition of child. The management of these conditions are considered in their appropriate places.

Anomalies in forces of expulsion may be deficiency or excess of expulsive force.

INERTIA UTERI

Inertia uteri or deficient expulsive force is common. The **causes** are: (1) Fatigue; (2) overdistention of uterus by hydramnios or twins; (3) faulty innervation of uterine muscle; (4) many previous labors; and sometimes (5) fear of the physical pain of the contractions.

Time of Occurrence.—May occur at any time during the labor, but is most frequent during the first stage and next at the end of second stage, the so-called terminal inertia.

Diagnosis is usually easy. The uterine contractions become less frequent and shorter; the uterus is not as hard as it normally should be; the patient's suffering is obviously slight, and there is no advance in labor. The dilatation of the cervix is slow or does not progress at all, and the presenting part remains stationary.

Differential Diagnosis.—Inertia uteri must be distinguished from *overdistention of the lower uterine segment*, in a case of obstructed labor. In the latter, the lower portion of the uterus does not contract at all; there is a high contraction ring which

should be visible on the abdomen; in bad cases the upper, contracted portion of the uterus can be distinctly felt above the contraction ring; and a careful pelvic examination will usually reveal the cause of the obstruction. A mistaken diagnosis will usually mean the patient's death from a ruptured uterus.

Treatment of inertia depends upon the cause, and no single plan of treatment will answer in all cases. If due to fatigue, a hypodermic injection of $\frac{1}{6}$ gr. of morphin will usually give the needed rest. Morphin, or morphin and scopolamin, is safe for the child only in the first stage of labor. More often, however, the uterus requires stimulation, the methods being: (1) Kneading the uterus with the hand; (2) bougies or bags; (3) the application of forceps; (4) stimulation by drugs.

Kneading the uterus with the hand is of little use, being fatiguing to the doctor and patient and of no value except just at the very last of the second stage.

The insertion of two bougies or a boiled rectal tube into the cervix and lower uterine segment is often difficult, on account of the position and engagement of the presenting part. If successful, the value depends upon the bougies acting as a foreign body and thus exciting the uterus to contraction.

The *application of forceps* requires dilatation of the cervix of about three fingers, and rupture of the membranes. The head is pulled down enough to irritate the cervix and thus cause uterine contractions, and no attempt is made to deliver the head. Also a method of doubtful utility, and one possessing dangerous possibilities, if abused.

Drugs are the most valuable means of stimulating uterine contractions. Those used are quinin, ergot, alcohol and pituitrin. *Quinin* is unreliable and in patients who have an idiosyncrasy against it is liable to cause severe postpartum hemorrhage. There are some women in whom a dose of quinin will cause the menstrual flow to appear. These women cannot take quinin in labor. It is used in a single large dose of ten to twelve grains. Small doses are useless.

Ergot is *never* given as long as the child is in the uterine

cavity *except* between the birth of the two children in twins. In twins, the birth-canal has already been dilated by the passage of the first child, and the interval between the two children is, or should be, so short that no contraction need be feared. The ergot is given here as a preventive of postpartum hemorrhage, and not to excite expulsive pains. Otherwise it is more liable to cause further delay by stimulation of the circular fibers of the cervix, as well as the longitudinal fibers of the uterine muscle.

Alcohol is given as brandy, one-half ounce, whiskey one-half ounce, or sherry two ounces, with a few crackers or piece of toast, to guard against the nausea often produced by alcohol upon an empty stomach. It is unreliable as to action and is often vomited.

Pituitrin.—The best of all the oxytoxics is pituitrin (pituitary extract, hypophysin), a solution of the active principle of the posterior lobe of the hypophysis cerebri. It was first used extensively in 1909, though in limited use a few years prior to this. It is given deeply intramuscularly and not subcutaneously, in doses of ½ to 1 mil. It is a powerful stimulant to all unstriped muscle, and if used recklessly is a most dangerous drug. Its action on the uterine muscle is of greatest intensity when the patient is already in labor; it is not so intense when used to induce labor; and as an abortifacient it is entirely unreliable. If used according to the following directions, its use should be followed by gratifying success.

1. It should be given in primiparæ only when the head has passed through the cervix.

2. It should be given in multiparæ only when the cervix is thoroughly effaced, fairly dilated and easily dilatable.

3. It should never be given to any patient, if there is any obstacle to an easy delivery.

4. One-half mil doses are as effective as 1 mil and safer.

5. It should be given deeply intramuscularly, preferably in the deltoid, and not subcutaneously or above all *not intravenously.*

6. Overdose is liable to be followed by relaxation of the uterus and postpartum hemorrhage. More than 2 mils, as a total amount, should not be used in any labor.

7. In syphilitic patients, the danger of rupture of the uterus is greatly increased, and pituitrin should not be used at all.

8. Stronger solutions are on the market, for use after surgical operations. This "surgical" pituitrin should be avoided in obstetrical work.

9. If inertia occurs early in first stage of labor, before the os is well dilated, 3 doses of 3 minims each, an hour apart, often act very well.

Accidents from its use have been: (1) Rupture of the uterus; (2) fetal asphyxia from violent uterine contraction; (3) postpartum hemorrhage; (4) premature separation of placenta; (5) extensive laceration from precipitate delivery.

Other means of stimulating uterine contractions are: (1) Simple soapsuds enema; (2) separation of the membranes around the internal os; (3) rupture of the membranes (advisable in multiparæ only).

Recently there has been put on the market a stronger preparation of pituitrin, intended to combat intestinal paresis after abdominal operations. It is labeled Pituitrin S. and should never be used in obstetric work, unless the obstetric preparation, labeled Pituitrin O is not available. If the pituitrin S is used, ½ mil is the maximum dose and ¼ mil is better. The full dose of 1 mil should *never* be given.

Terminal inertia, occurring when the head is on the perineum, is managed by kneading the fundus, a hypodermic of ½ mil of pituitrin or by the application of forceps; the short Sawyer forceps being here better than the heavier Simpson instrument. Terminal inertia is often due to weakness of the abdominal muscles, or the unwillingness of the patient to use the abdominal muscles, on account of the pain. In either case it can be corrected by the use of the Sawyer forceps, with moderate or complete anesthesia.

Excessive uterine force may result in extensive lacerations to the mother; injury to the child by expulsion with the mother in the erect posture, when the cord will probably be ruptured; and in precipitate labor.

Treatment.—Take away the puller, retard the advance of the child's head over the perineum by direct pressure, and inhibit use of abdominal muscles by having patient breathe rapidly with open mouth.

DYSTOCIA DUE TO BONY PELVIS

Deformities of the Pelvis

Frequency.—From 5 to 20 per cent. of women have some degree of contracted pelvis, but in only 3 to 5 per cent. is this contraction serious enough to cause trouble in labor. Ordinarily pelves whose internal conjugate is over 9.5 cm. will cause no serious delay in delivery.

Methods of diagnosis are: (1) Some obvious visible deformity, which is often not present; (2) pelvimetry; (3) the *x*-rays, which will show characteristics of some deformed pelves but are unreliable for measurements.

Pelvimetry is of two classes: (1) External and (2) internal.

The normal pelvic measurements are:

External Measurements.—(1) *Anterior superior spines of ilia*—26 cm.; (2) *crests of ilia*—29 cm.; (3) *trochanters*—31 cm.; (4) *external obliques*—from one posterior superior spine of ilium to opposite anterior superior spine—22 cm. The oblique diameters are named from behind; (5) *external conjugate* or *Baudelocque's* diameter—from the depression below the spinous process of the last lumbar vertebra to the middle of the symphysis, ¼ inch below its upper margin—20.25 cm. (*Michaelis' diameter* begins at the tip of the spinous process and is 21.5 cm.); (6) *transverse of the outlet*—between the tuberosities of the ischium—11 cm.; (7) the *sagittal diameters of the outlet*—begin at a line corresponding to the transverse of the outlet and from there to the

bottom of the symphysis for the anterior (5.5 to 6 cm.) and to the tip of the sacrum for the posterior (9.95 cm.). They are of importance in the management of pelves contracted transversely; (8) the *circumference* of the pelvis—from the depression below the spinous process of the last lumbar vertebra over the crest of the ilium to the middle of the symphysis and doubled—90 cm.

Internal Measurements.—(9) The *internal conjugate diagonal* —from the promontory of the sacrum to the bottom of the

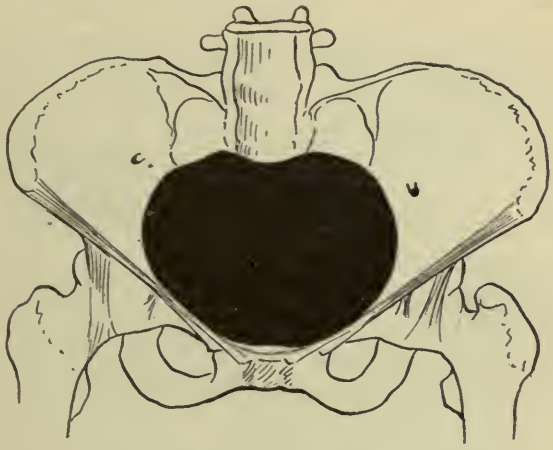


FIG. 92.—Normal pelvic inlet. (*De Lee.*)

symphysis—12.75 cm.; (10) the *true conjugate* or *conjugate vera* —from the promontory of the sacrum to the inner surface of the symphysis; ¼ inch below its upper edge—11 cm.

Any pelvis two or more centimeters short in an important diameter, is said to be contracted. All these measurements, except the sagittal diameters, are most conveniently taken with the ordinary calipers. The sagittal diameters require a special instrument; and the circumference, a tape measure.

Relation of external to internal conjugate is that it forms a fairly reliable guide to when it is necessary to measure the *internal* conjugate, but it does not tell how small the internal

conjugate is. The rule ordinarily applied in practice is: If the external conjugate is below 16 cm. the internal conjugate is seriously contracted; from 16 to 18 cm. there will be serious contraction in about half the cases; from 18 to 20¼ only a small proportion will have an internal contraction; and above 20¼, there is almost sure to be no internal contraction. Therefore below 18 cm., the internal conjugate should always be measured; above 18 cm. it is hardly necessary. However, too much importance must not be attached to the external measurements alone.

FIG. 93.—The digital method of measuring the internal conjugate diagonal. From this the true conjugate is calculated by the method described in the text. (*Dickinson.*)

Methods of measuring the internal conjugate are the manual and the instrumental.

Technic of Manual Method.—The patient is placed in the lithotomy position, and the external genitalia are carefully cleansed. An anesthetic is sometimes required, if patient is very nervous. Two fingers of one hand are inserted in the vagina, and the tip of the middle finger is placed against the promontory. The place where the subpubic ligament touches

the hand is then marked, the fingers withdrawn, and the distance between that point and the tip of the middle finger is measured with a pair of calipers or a tape measure. This distance is the *internal conjugate diagonal.* From it the *true conjugate* is estimated by subtracting 1.75 cm. in every form of pelvis except the rachitic, and the generally contracted flat nonrachitic, where 2 cm. are subtracted. This method is very accurate, on the average, and is the method most often employed. If it is difficult to reach the promontory with the examining finger, serious contraction need not be feared.

The Instrumental Method.—Of the many instruments devised for the direct measurement of the internal conjugate, the best for general use is B. C. Hirst's pelvimeter. With this instrument the distance is taken between the promontory of the sacrum and the outer surface of the symphysis pubis, just below its upper edge. Then the thickness of the symphysis is measured and the second measurement subtracted from the first.

The Neumann-Ehrenfest pelvigraph plots out a chart of the pelvis upon a piece of paper, as does the perimeter in plotting out the eye-ground. The Neumann-Ehrenfest kleiseometer measures the pelvic inclination. They are adapted for use in the hands of specialists only, and are too complicated and difficult to manipulate for use in general practice.

The Sagittal Diameters and Their Measurements.—The sagittal diameters are the practical anteroposterior measurements of the pelvic inlet. The anteroposterior diameter in the dried specimen runs in a straight line from the bottom of the symphysis to the tip of the sacrum. The sagittals run from the bottom of the symphysis to a base line representing the line between the tuberosities of the ischium, and thence to the tip of the sacrum.

To measure the sagittals, the patient is arranged in the dorsal position. A special pelvimeter may be used but is entirely unnecessary. The necessary base line is established by a tape measure stretched between the tuberosities of the ischium

and held there by an assistant. With ordinary calipers, the distance from the center of this line to the bottom of the symphysis is measured and averages five and a half to six centimeters. This is the anterior sagittal. From the center of the line to the tip of the sacrum is the posterior sagittal and averages ten centimeters (9.95).

The *index of the outlet* based upon the sagittal diameters can be calculated by an ingenious formula devised by Dr. C. D. Daniels, of Philadelphia. If the altitude of a triangle

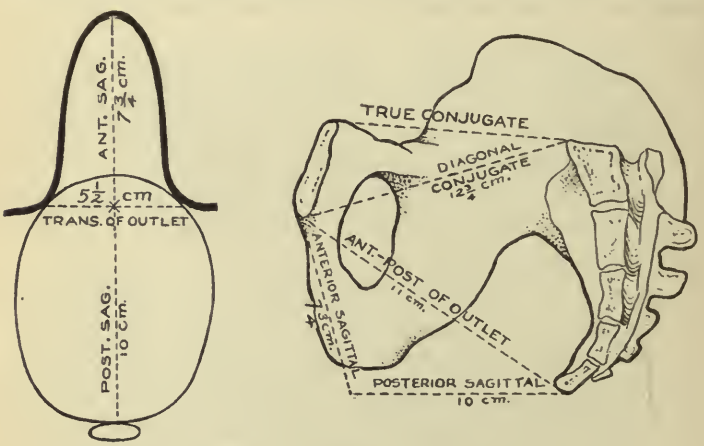


FIG. 94.—Planes of sagittal diameters of outlet.

is multiplied by its base and the result divided by two, the approximate area of the triangle is found. In this case the *altitude* is the posterior sagittal diameter; the *base* is the distance between the two tuberosities of the ischium. Therefore, in a normal pelvis, the area of the triangle whose altitude is the posterior sagittal diameter, is 55 sq. cm.

$$\frac{\text{Altitude} \times \text{base}}{2} = \frac{10 \times 11}{2} = \frac{110}{2} = 55.$$

This figure (55) is taken as the normal, and called the *index of the outlet.* If this index is 55 to 33, as a rule spontaneous delivery may be expected; if 33 to 28 considerable difficulty will

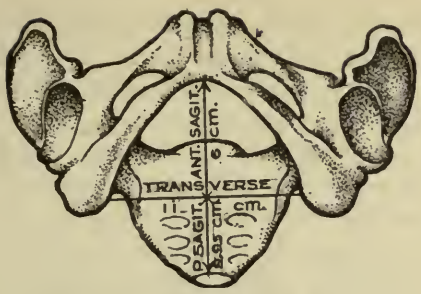


FIG. 95.—Normal sagittal diameters of the pelvic outlet.

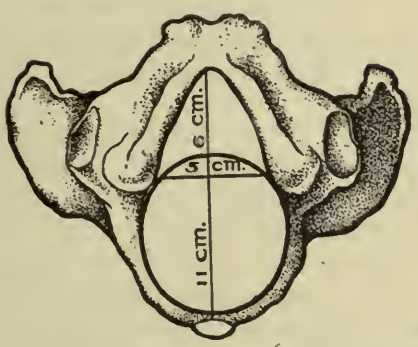


FIG. 96.—Importance of sagittal diameter. Though the contraction transversely is extreme, the long posterior sagittal permits delivery.

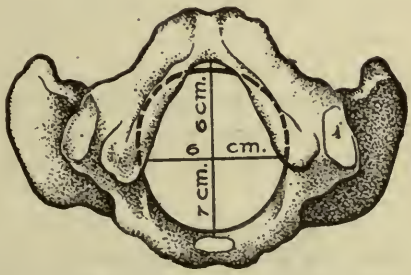


FIG. 97.—Importance of sagittal diameter. Though the transverse of outlet is 6 cm., the short posterior sagittal will not permit of delivery.

be experienced and below 28 the difficulty is liable to be insuperable. These figures are as yet more or less dogmatically taken, and numerous exceptions to the working of the rule will be found.

Antepartum Fetometry.—All pelvic measurements are relative to the size of the child. The process of testing the relative size of the child's head to the pelvic inlet is called antepartum fetometry.

(1) *Müller's Method.*—With patient on her back, try to push head into pelvis, by pressure from above.

(2) *B. C. Hirst Modification of Müller.*—If the head, when pushed down by the Müller method, will not enter the superior strait, note the relation of the anterior parietal eminence to the symphysis, if it does not project beyond the symphysis, spontaneous delivery is possible.

(3) *Perret's Method.*—The occipitofrontal diameter of the child's head is measured, through the mother's abdominal wall. A fold of the abdominal wall is pinched up and measured, and this subtracted from the first measurement.

(4) *Stone's Method.*—The occipitofrontal diameter is measured. No allowance is made for the thickness of the abdominal wall. In heads with an occipitofrontal diameter of 11 cm. or less, 2 cm. is subtracted to find the biparietal; if over 11 cm., 5 cm. is subtracted.

Pelvic inclination is *increased* in all flat pelves (a flat pelvis is one where the chief contraction is anteroposterior at the inlet) especially the rachitic. It is *diminished* or *lost* in: (1) Kyphosis; (2) spondylolisthesis.

Frequency of Deformed Pelves.—The commonest deformity of the pelvis is the simple flat. Next the justominor, and third the rachitic. The most common *serious* deformity is the rachitic.

Classification of Deformed Pelves.—The following classification of deformities of the pelvis has been found easy for the student to remember and is sufficiently accurate for all practical purposes. It is arranged in groups, based upon

the predominating deformity, so each group has essentially the same effect upon the mechanism of labor and is managed by the same general rules.

I. Pelves Whose Chief Deformity is Anterior Posterior Contraction at the Inlet.

1. Simple flat.
2. Justominor.
3. Generally contracted flat, nonrachitic.
4. Rachitic.
5. Spondylolisthesis.
6. Osteomalacia (malacosteon).
7. Kyphoscoliosis.

II. Pelves Whose Chief Deformity is Contraction of Transverse Diameters, Especially at the Outlet.

1. Kyphosis.
2. Fetal funnel-shaped.
3. Robert.

III. Pelves Whose Chief Deformity is Oblique Contraction:

1. Nägele.
2. Unilateral deformity (coxalgia, disease of one leg, clubfoot, etc.).

IV. Atypical Pelves.

1. Justomajor.
2. Split pelvis.
3. Assimilation pelvis.
4. Lordosis.
5. Fractures (old) of pelvis.

V. New Growths.

1. Exostoses.
2. Osteosarcoma.
3. Enchondroma.

Diagnoses and Management of Deformed Pelves.—For convenience in study, the pelves will be considered in groups, according to their chief deformity.

I. PELVES WHOSE CHIEF DEFORMITY IS CONTRACTION OF THE CONJUGATA VERA

Simple Flat Pelvis.—The commonest and least serious deformity of the pelvis.

Cause.—Indefinite. Has been ascribed to arrested rickets, overwork, carrying heavy weights, or too early sitting or walking in childhood.

Characteristics.—The sacrum is pushed downward and forward, but not rotated on its transverse axis. All the anteroposterior diameters are shortened, and the transverse and

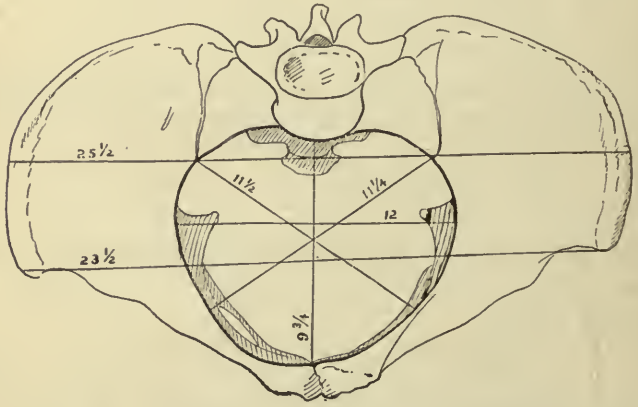


FIG. 98.—The characteristic measurement of a simple flat pelvis. (*De Lee.*)

oblique practically normal. There is sometimes a second or accessory promontory. The conjugate is very rarely less than 8 cm.

Effects on the mechanism of labor are that the head is (1) imperfectly flexed; (2) engaged in the transverse diameter of the pelvis; (3) there is exaggerated lateral inclination; (4) the dilatation of the cervix is slower than normal.

These are the effects upon the mechanism of any *flat* pelvis, where a short conjugate is the chief obstruction.

Effect upon Labor.—Rarely serious, as the conjugate is rarely below 8 cm.

Justominor or Generally Equally Contracted Pelvis.—This is the second in frequency among the white races.

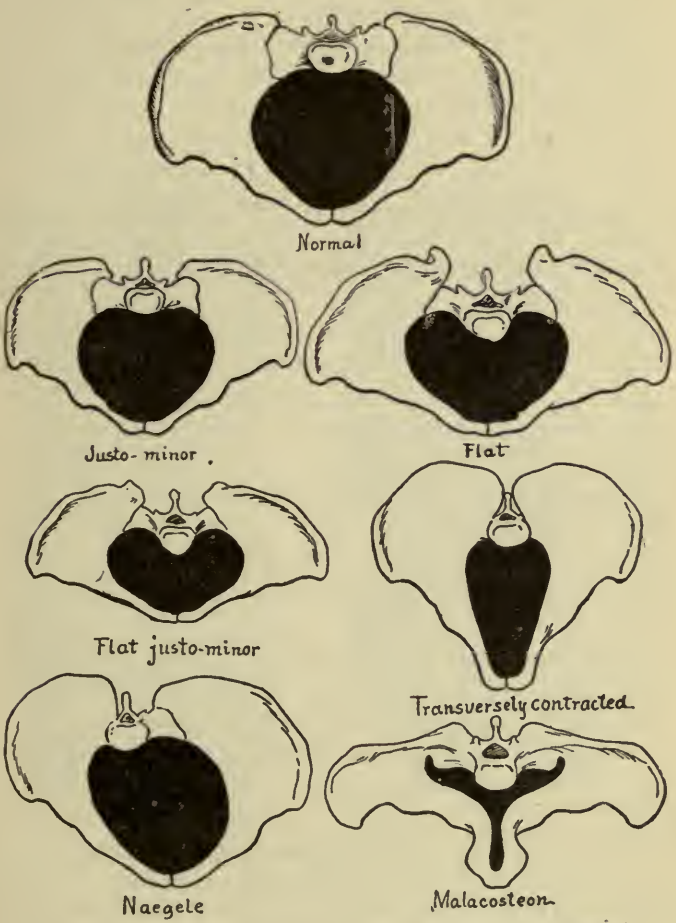


FIG. 99.—Various shapes of the pelvic inlet. (*Bumm.*)

Cause.—Arrested development.

Characteristics.—Is usually seen in women of small stature.

The hips are abnormally narrow; the bones are lighter than normal; the joints are not as firm as normal; all measurements are proportionately reduced, except the circumference of the pelvis, which is far below normal.

Varieties.—(1) Juvenile; (2) masculine; (3) dwarf (pelvis nana). The first is the usual type. The other two are rare.

Effect Upon Mechanism of Labor.—Slight, except to give excessive flexion and often transverse engagement of the head.

Effect Upon Labor.—Not usually serious. In the application of forceps, great care must be used, in traction, to avoid fracture of the pelvic joints.

Generally Contracted Flat (Non-rachitic) Pelvis.—*Cause.*—Same as simple flat.

Characteristics practically a combination of the simple flat justominor pelves. All the diameters are reduced, but the conjugate is disproportionately small.

Effect upon mechanism is that of any flat pelvis. (See simple flat).

Effect upon labor is more serious than either of the foregoing.

Rachitic Pelvis (Rickets).—The third in frequency of deformities of the pelvis; the most common of the types in which serious difficulty is met in labor, and the most frequent deformity in the colored race.

Varieties.—(1) Generally contracted flat; (2) generally equally contracted; (3) simple flat.

The first one is much the commonest.

There is described a *pseudo-osteomalacic* type of rachitic pelvis, the most serious form, but so rare as to be a negligible factor.

Cause.—Rickets in early childhood; the downward pressure of the weight of the trunk, and the upward and inward pressure of the femora.

Characteristics.—The sacrum is pushed downward and forward, rotated on its transverse axis and sharply bent in the middle; the posterior spines are closer than normal; the anterior superior spines are flared wider apart; the acetabulæ are

further anterior; the normal curvature of the innominate bones is increased; the conjugatosymphyseal angle is increased; pelvic inclination is markedly increased; and the pubic arch is abnormally wide. The lozenge or rhomboid of Michaelis, formed by lines joining the depression below the spinous process of the last lumbar vertebra, the two dimples below the posterior superior spines of the ilia and the beginning of the

FIG. 100.—The rhomboid or lozenge of Michaelis, as seen in a normal pelvis. (*Bumm.*)

FIG. 101.—The lozenge of Michaelis as seen in a rachitic pelvis. (*Bumm.*)

intergluteal fold (the tip of the sacrum) is changed from its usual diamond shape into a kite or triangular figure.

Diagnosis.—The patient is often a negress, has a waddling gait, and is short, pigeon-breasted, sway-backed and bow-legged. All the pelvic measurements are decreased, but the

conjugate is disproportionately small. The distance between the spines of the ilia is often as great as or greater than the crests. The rhomboid or lozenge of Michaelis is changed to a kite-shaped or triangular figure. Sway-back is marked. The pubic arch is wide, and usually all the obstruction is at the pelvic inlet. The sacrum is felt to be sharply curved, the promontory is easily reached, and in calculating the *internal* from the *diagonal* conjugate, 2 cm. must be subtracted. A false or double promontory, from the forward displacement of the first sacral vertebra, is not unusual.

Effect upon the Mechanism of Labor.—That of a flat pelvis. (See simple flat.)

Effect upon Labor.—This is usually most serious, as the conjugate is sometimes as small as 5 cm.

Osteomalacia is rare in this country, not uncommon in parts of Europe, notably Austria and Italy.

Cause.—A rarefying osteitis, seen in adult life, with absorption of the lime salts and consequent softening of the bones. Due usually to unhygienic surroundings and improper food.

Characteristics.—The bones, in advanced cases, are of leathery consistency. The sacrum is pushed far down in the pelvic canal. The innominate bones are pushed in by the femora. The symphysis projects forward like a beak. By vaginal examination, the general contraction of the pelvic cavity and sometimes its almost entire obliteration can be recognized, and the pubic arch is extremely narrow. The *x*-ray shows well the shape of the pelvis.

Symptoms and Diagnosis.—The attack begins usually by rheumatoid pains in pregnancy, associated with a progressive loss in height. The pain is worse on any exertion, but relieved by rest in bed. Then the patient has to walk by throwing each leg outward in a half circle, to avoid striking her internal malleoli together as she walks—the *osteomalacic gait.* The labors she may have during the progress of the disease, which is slow, are increasingly difficult, and finally cesarean section is required.

Effect on the Mechanism of Labor.—When possible at all, that of a flat pelvis.

Effect upon Labor.—Makes delivery more and more difficult as the disease progresses, finally requiring cesarean section.

Management.—At first, forceps are sufficient; later craniotomy and finally cesarean section are necessary. When cesarean section is done, the Porro operation is the better, as the disease is sometimes arrested by the increased deposition of lime salts in the bones that follows removal of the ovaries and uterus. It is possible, however, to deliver a patient with forceps whose measurements, applied to any other pelvis, would make the delivery impossible, as the bones will give enough to allow passage of the child.

Spondylolisthesis is a pelvis in which the last lumbar vertebra has slipped downward and forward over the anterior face of the sacrum, by elongation and secondary fracture of its arches. It is comparatively rare.

Characteristics.—The last lumbar vertebra is displaced over anterior face of sacrum. The sacrum is pushed backward, and its tip projects into pelvic canal. Pelvic inclination is diminished. The pelvis is somewhat funnel-shaped and the pubic arch is narrow. The measurements chiefly contracted are the conjugate, the anteroposterior and transverse diameters of the outlet.

Diagnosis.—The patient has a saddle-back, from prominence of innominate bones. The measurements involved are those stated above. The external conjugate may be normal, but the internal seriously encroached upon. The patient's abdomen is markedly shortened. The spinous process of last lumbar vertebra is prominent. The internal conjugate is measured from the most prominent part of the projecting vertebra.

Effect upon Mechanism of Labor.—When possible that of a flat pelvis.

Effect upon Labor.—Usually insuperable obstruction.

Kyphoscoliosis.—In this pelvis the humpback is situated in the dorsal region, is more rounded than angular, and is usually

due to rickets. The lateral curvature is usually to the right.

Characteristics.—The characteristics of the rachitic pelvis, with asymmetry.

Management of Labor in All Flat Pelves.—To avoid repetition, the management of labor in all pelves where the conjugate is the diameter most seriously involved, will be considered here.

It is impossible to lay down rules to fit every case, but the following rules will be found reasonably accurate. If the patient is first seen *before labor:* If the conjugate is between 11 *and* 9.5 *cm.*, ordinarily no interference is indicated; between 9.5 *cm. and* 8 *cm.*, the induction of premature labor, two to four weeks short of term, with probably the use of forceps or version will usually give the best results; from 8 to 7 *cm.*, induction of premature labor, with forceps, and if after a moderate trial (twenty minutes maximum) the forceps fail, pubiotomy, symphyseotomy or cesarean section is required; *below* 7 *cm.* cesarean section seven days before term is best.

If the patient is first seen *during labor:* With a conjugate from 11 *to* 9.5 *cm.* spontaneous delivery is the rule, and nothing more than forceps will be required; from 9.5 *to* 8 *cm.*, choice between axis-traction forceps or version, usually the former, provided the head does not engage spontaneously, and the more serious procedures are necessary when the forceps have failed; *from* 8 *to* 7 *cm.* axis-traction forceps may be cautiously tried, but if they fail, pubiotomy or cesarean section is required; *below* 7 *cm.* only cesarean section should be considered. It must be understood that the axis-traction instrument markedly increases the danger to the child, and if it is used at all, it must be with due recognition of this fact. All cases, where there is a reasonable probability of spontaneous delivery, should be given a *test of labor*, to see what they can do for themselves. It is astonishing what flexion and moulding will do, in many cases. A primipara can be safely allowed to go for twenty-four hours; a multipara for twelve only (on account of the greater danger of rupture of the uterus).

Should either patient show signs of exhaustion, or danger signals for the baby appear, earlier interference would be indicated.

The above measurements apply only to cases where the child's head is of normal size. An overgrown child will com-

FIG. 102.—The Walcher position. (*Bumm.*)

plicate matters exceedingly. A careful estimation of the size of the child's head compared to the pelvic inlet should always be made. If, when the head is pressed firmly against the pelvic inlet, one parietal bone juts out beyond the symphysis, the obstruction is serious, and will very probably require cesarean

section, even though the pelvic measurements seem not to warrant it.

Craniotomy, in contracted pelves, is justifiable only if the child is dead.

The **Walcher position** is of advantage in the lesser grades of contraction, down to about 8 cm. It consists in placing the patient upon an improvised operating table (such as a kitchen table), her buttocks projecting just beyond the edge of the table, and her feet hanging down toward but not touching the floor. The ordinary bed is too low to be of service. This maneuver is said to add as much as 1 cm. to the conjugate. If forceps are to be used, they must be applied before the legs are let down. In pelves whose conjugate is less than 8 cm., the method is of no value.

II. PELVES WHOSE CHIEF CONTRACTION IS TRANSVERSELY AT THE OUTLET

Kyphosis.—In a typical case, the kyphosis is situated in the lumbosacral region, is angular and due to tubercular caries of bodies of vertebra.

Characteristics.—The sacrum is pushed backward. Pelvic inclination is lost. The tip of the sacrum is projected forward into the pubic canal. The pelvis is contracted transversely. The pubic arch is narrowed and often asymmetrical. The conjugate is often increased in length. In very marked cases, the spinal column overhangs the pelvic inlet, and renders impossible any engagement of the head—the *pelvis obtecta.*

Diagnosis.—The humpback is obvious. The patient stands with knees bent, due to lost pelvic inclination. The conjugate is increased, while the transverse measurements, especially of the outlet, are markedly contracted. The anterior and posterior sagittal diameters of the outlet are of the greatest importance. For spontaneous or forceps delivery, the posterior sagittal diameter must be at least 7.5 cm., as on account of the narrowed arch, all of the anterior sagittal diameter is not available. As the transverse diameter of the out-

let decreases, the posterior sagittal must increase to allow of delivery. The pubic arch is narrowed and often asymmetrical. The patient's abdomen is shortened, and when she is near term, markedly pendulous.

Effect upon the Mechanism of Labor.—Transverse presentation is common, but usually spontaneously corrected, the child finally presenting by the head. The head is often slow to engage, due to the pendulous uterus. Posterior rotation of the occiput is very frequent and should not be corrected, as there is more room for the delivery of the larger posterior portion of the head in the posterior sagittal diameter. In these cases episiotomy will nearly always be required. There is more or less complete obstruction at the outlet.

Effect upon Labor.—May be serious, depending upon the transverse diameter of the outlet.

Management.—If the distance between the tuberosities of the ischium is 8.5 cm. or over, spontaneous delivery is practically sure. If it is between 8.5 cm. and 6 cm., the induction of labor four weeks short of term and the use of forceps will probably be successful. Should forceps fail, symphyseotomy or pubiotomy make the delivery easy. With a diameter below 6 cm. cesarean section is best. It should always be determined whether the outlet is symmetric or not, as the asymmetric type is the more serious. Version is to be avoided, as the results to the child are bad, from difficulty in delivery of the head. Craniotomy is only indicated where the child is dead.

Fetal Funnel-shaped Pelvis.—*Cause.*—Anomaly of development.

Characteristics.—The pelvis is abnormally narrow and deep. The pelvic walls converge as they approach the outlet. The measurements of the inlet are normal, those of the outlet contracted, especially transversely. The pubic arch is extremely narrow.

Effect upon the Mechanism of Labor.—Imperfect flexion; backward rotation of the occiput; serious lacerations of the

perineum, unless episiotomy be done to avoid them, due to the head being forced backward at the outlet.

Effect on Labor.—Delays are common, forceps often required, and the obstruction may prove insuperable.

Management.—In minor grades, forceps are required, but injury of the soft parts often results. A transverse diameter of the outlet of 7.5 to 6 cm. is best managed by symphyseotomy or pubiotomy; below 6 cm. cesarean section is necessary. Craniotomy is only justifiable when the child is dead, and version should not be attempted. Posterior rotation of

FIG. 103.—The pelvic inlet in a fetal funnel-shaped pelvis. (*De Lee.*)

the occiput is the rule, and should not be corrected, for the same reason as in kyphosis.

Robert Pelvis.—The rarest type of pelvis.

Cause.—Failure of development of the alæ of the sacrum on both sides.

Characteristics.—The pelvic cavity is almost obliterated, from the uterine transverse contraction. The sacrum is very narrow.

Effect on Mechanism.—No mechanism is possible.

Effect on Labor.—Insuperably obstructed.

Management.—Cesarean section.

III. PELVES WHOSE CHIEF DEFORMITY IS OBLIQUE

Nägele Pelvis.—This is rare.

Cause.—Failure of development of the ala of the sacrum on one side.

Characteristics.—The pelvic inlet is obliquely oval. The atrophied joint is usually ankylosed. The sacrum is narrow and rotated toward the atrophied side. The innominate bone on diseased side runs almost straight to the symphysis. The other innominate bone is more curved than normal. The pubic arch is narrow and asymmetric. The diagnosis requires careful measurements, as there is usually no limping or other obvious deformity, but the *x*-ray shows it plainly.

Effect upon the Mechanism of Labor.—That usually of a flat pelvis except that the head is extremely flexed, and the rotation is imperfect, and engages in the longest oblique diameter of the pelvis.

Effect on Labor.—This is serious and nearly all require major operative procedures.

Management.—Induction of labor four weeks short of term has given the best results, but only in cases where the distance from the bottom of the symphysis to the healthy sacro-iliac joint is not less than 8.5 cm. In other cases, cesarean section has been most successful. Forceps and version are not of value.

Oblique Deformity Due to Absence or Disease of One Extremity (Coxalgia, Loss of One Leg, Club-foot, etc.).—This produces a moderate oblique deformity on the *sound* side, due to the weight of the body being constantly thrown on that side. It is not a serious deformity, the difference between the oblique diameters being rarely more than 1.5 or 2 cm., and with a child of normal size, no obstruction to labor need be expected.

IV. ATYPICAL PELVES

Justomajor Pelvis.—(Generally equally enlarged).

Cause.—Usually excessive stature, but may be seen in women below normal height.

Characteristics.—All measurements proportionately larger

than normal. Bones larger and heavier. Impossible to reach the promontory with examining finger.

Effect on Mechanism.—None except possibly abnormalities in rotation, due to insufficient resistance.

Effect on Labor.—Predisposes to precipitate delivery; there may be delay from resistance of soft parts.

Split pelvis is a very rare form. It is due to failure of development of the symphysis and is associated with exstrophy of the bladder. The obturator foramina are open. It has no effect upon labor, except that the thighs have to be supported, to prevent fracture of the sacro-iliac joints, from undue separation of the bones.

Fractures of the pelvis do not usually cause trouble unless union with marked deformity has occurred. In such cases, the obstruction may be insuperable.

Atrophy, caries and necrosis have the same effect as improperly united fractures.

Synostosis or **immovable pelvic joints** result in loss of the slight normal elasticity of the pelvis, and do not cause serious obstruction.

Lordosis is extremely rare, as a primary condition. When not secondary to some pelvic deformity, the pelvic inclination is tremendously increased, and labor is complicated by failure of the head to engage in the pelvic canal.

Assimilation pelvis is the term used to describe the pelvis in which the transverse processes of the last lumbar vertebra are transformed into structures similar to the lateral masses of the sacral vertebræ. Thus the last lumbar vertebra assumes the functions of the first sacral vertebra.

Rarely the first sacral vertebra takes the characteristics of a lumbar vertebra and becomes part of the lumbar spine. In the first case, the pelvis is increased in depth; in the latter, decreased but in both cases without marked influence on the course of labor.

Luxation of both femora causes extreme lordosis, a widening of the pelvis, particularly at the outlet, the conjugate is

somewhat contracted, but rarely is less than 9 cm.; hence the obstruction to labor is slight.

V. TUMORS OF THE PELVIC BONES

New growths are either: (1) Exostoses; (2) enchondroma and osteosarcoma.

Exostoses are of two classes: (1) Spines (acanthopelys or pelvis spinosa) and (2) knobs.

Cause.—Sometimes due to rickets, but most cases have no demonstrable cause.

Situation most commonly over sacro-iliac joints, next over symphysis, and last all around the pelvic brim.

Diagnosis by deep pelvic examination. Unless attention is directed to them by some external deformity, they are likely to be overlooked.

Management.—The knobs do not ordinarily cause much trouble in labor. The spines will perforate the uterus during labor, and for that reason cesarean section is the safest method of delivery.

Enchondromata and osteosarcomata are usually in the hollow of the sacrum, cause an insuperable obstruction, and require cesarean section.

DYSTOCIA DUE TO THE MATERNAL SOFT PARTS

Edema of vulva is commonly due to pressure, rarely to kidney insufficiency. Its chief importance in labor is the danger of laceration of the perineum, and the likelihood of infection or possibly gangrene. The treatment is the application of hot water or puncturing the most dependent portion of the labia with a thin-bladed knife, under aseptic precautions.

Varicose veins of the vulva are dangerous on account of the hemorrhage, if they are torn. The hemorrhage is always profuse, requiring suture or ligature. The patient should be instructed how to apply pressure, in emergency.

Abscess of Bartholin's gland is often a cause of puerperal sepsis. The abscess should be opened early in labor, the

cavity curetted, swabbed with carbolic acid and packed. The excision of the gland entire is not advisable at this time, on account of the free bleeding.

Anus vestibularis, or a **rectovaginal fistula,** complicating labor adds considerably to the risk of infection. If possible, it should be closed with a purse-string suture just before the head comes down on the perineum, the suture being removed immediately after delivery.

Tumors of the vagina or vulva are usually either fibroids (elephantiasis) or cysts. They are not often of a size to complicate labor, but if they are they must be removed if solid and punctured if cystic, and the child delivered by forceps.

Overdistended bladder may interfere with the engagement of the head, become incarcerated, and a vesicovaginal fistula result. Forceps, particularly, should never be applied with a full bladder. Catheterization with a long stiff silk or metal catheter (*not* a glass or soft rubber one) will obviate any difficulty.

Overdistended rectum may interfere with delivery of the head, but an enema will correct the condition.

Cystocele and **rectocele** complicate labor only if they become incarcerated and edematous from pressure. If so, forceps is the remedy. Usually labor is extraordinarily easy, after the head has passed through the cervix, due to lack of resistance.

Atresia of the vagina is never complete or pregnancy would be impossible. There is always a sinus, however small and tortuous, communicating with the cervix. The canal can usually be dilated by metal or hydrostatic dilators, with or without deep longitudinal incisions. In some cases, especially those due to extensive cicatrices from previous inflammation, cesarean section may be required.

Septa of the vagina are most often transverse, and if an obstruction to delivery, can be divided between two ligatures. If longitudinal, they are cut in several places, and the slight hemorrhage controlled by sutures.

Rigid perineum is common in primiparæ, particularly after the age of thirty-five; it is also often due in multiparæ to previous plastic operations. If the head is stationary on the perineum for more than one hour, forceps is indicated. The short Sawyer forceps is usually sufficient. More than one hour's delay is dangerous, both on account of the pressure on the child's head and the danger to the mother, from straining, of acute dilatation of the heart.

Atresia of the cervix is most commonly caused by improperly performed repair of laceration. The opening of the cervical canal is often situated far to one side, near the vaginal vault. The site of the normal orifice can always be seen or felt, and a small opening should be made in the center. The further dilatation of the canal proceeds rapidly. If there is much cicatricial infiltration, multiple incisions of the cervix may be required.

Rigidity of the cervix is common, to a greater or lesser degree, to all primiparæ. It is not often excessive before the age of thirty-five. It is due also, in multiparæ, to scars of previous operations for repair of tears, or cicatricial infiltration, specific or malignant. The *symptoms* are slow dilatation of the cervix, and the thick resistant band of cervical tissue which can be felt. If neglected, the thick, edematous cervix will sometimes tear completely off—the so-called annular detachment. The *treatment* consists in first allowing plenty of time, provided the cervix does not become edematous. Usually it is not necessary to resort to artificial means of dilatation. Every effort should be made to preserve the membranes. If dilatation is not spontaneous, it may be secured by manual dilatation; hydrostatic dilatation or even multiple incisions, should milder methods not answer. The dilatation of the cervix by the application of forceps and traction is not to be recommended, due to the high fetal mortality. Version is also to be avoided in cases of rigid cervix. If the cervix becomes edematous, and is fairly well dilated, it is often possible to complete dilatation by pushing the cervix back over the head,

during the pains. All unnecessary or prolonged manipulations should be avoided, on account of the danger of infection. In extreme cases, vaginal cesarean section may be required, though in these cases the danger to the bladder must be remembered.

Cancer of the cervix complicating pregnancy and labor is rare. When it occurs, the disease is considerably aggravated. The chief dangers are hemorrhage (from lacerations) and sepsis. The treatment is: (1) cauterization of the sloughing cervix; (2) abdominal cesarean section; (3) panhysterectomy (which is considerably complicated by hemorrhage). The prognosis, due to the widely dilated vessels and lymph spaces, is not favorable.

Displacement of the Uterus.—*Anterior* due to a diastasis of the rectus muscles, and an extreme anteversion of the uterus. The patient's abdomen is very pendulous and the diagnosis is obvious.

The anteversion of the uterus prevents the engagement of the presenting part in the pelvic inlet. An abdominal binder restoring the uterus to proper position will correct the difficulty and labor will proceed naturally.

Backward.—Pregnancy can go to term in a retroverted uterus only by extreme overdistention and thinning of the anterior uterine wall (sacculation). The very thin anterior wall can be palpated, and the fetal body and extremities are very distinct. Vaginal examination will show the thick posterior wall of the uterus, adherent in the pelvis.

Spontaneous delivery is not possible, as the thin anterior wall has not sufficient contractile power. Rupture of the uterus is to be feared. Dilatation of the cervix and forceps (*not* version) is the best form of treatment. Cesarean section may be required, if the wall is very thin. The uterus and vagina must always be packed after delivery, as the danger of postpartum hemorrhage is great.

Prolapse does not usually complicate labor. If the cervix becomes edematous, forceps and countertraction on the cervix is required.

Posterior Displacement of the Cervix.—In many primiparæ, the anterior portion of the lower uterine segment is overdistended by pressure of the head from above, and the cervix is drawn up posteriorly, usually effaced, near the promontory of the sacrum. In the ordinary vaginal examination, the patient appears to have no cervix. In labor the dilatation of the cervix is greatly retarded, or even arrested. The management is easy. Feel high up near the promontory for the external os, hook the forefinger in the os, and pull down during a pain. Three or four tractive efforts are usually all that are needed, provided the cervix is effaced and pains active.

Labor in double uterus is often complicated by inertia and postpartum hemorrhage. It is usually necessary to terminate the labor by forceps, and often to pack the uterus and vagina for profuse bleeding. A puzzling feature is the feeling of an undilated cervix in labor, if the non-pregnant half of the genital canal be entered by the examining finger.

Fibroid Tumors of the Uterus.—For convenience, the complication of fibroids in pregnancy, labor and puerperium will be considered here.

Fibroid tumors are often a cause of sterility, and it is comparatively rare to see them in pregnancy or labor. When they co-exist with pregnancy they complicate the pregnancy by: (1) Rapid growth, due to the increased blood-supply; (2) abortion; (3) hemorrhage; (4) excessive pain; (5) malpresentation of the child (transverse, etc.).

The complication in *labor* depends upon the situation of the fibroid and its size. If it is situated above the pelvic brim, and does not become incarcerated in the pelvis, it will not be an obstruction and the only complications are those due to its presence, such as placenta prævia, inertia, malposition of the child or rupture of the uterus. If it is impacted in the pelvis, it is very likely to cause serious obstruction, although a fibroid which no amount of pushing could dislodge from the pelvis is not unlikely to be pulled up above the brim by the continued uterine contractions, if sufficient time be given.

Fibroids complicate the *puerperium* by: (1) Postpartum or puerperal hemorrhage, and infection.

Management.—Fibroid tumors in pregnancy do not often require treatment. For excessive pain or bleeding or very rapid growth they may have to be removed, but as this almost invariably means the termination of pregnancy, they should be let alone if possible.

In labor, the treatment depends upon the position and size. If above the pelvic brim, they usually require no treatment. If impacted in the pelvis, and a reasonable wait has not secured

FIG. 104.—The use of a chair in bed, to secure the Trendelenburg position. (*De Lee.*)

their spontaneous dislodgment, the patient should be placed in the Trendelenburg posture, etherized, the fibroid pushed out of the pelvis, if possible, and the child delivered with forceps. In this case, care must be taken to see that the forceps are applied to the head and not to the fibroid—a mistake not difficult to make. If it is impossible to push the fibroid out of the pelvis, abdominal cesarean section is required, followed by myomectomy or hysterectomy—the former if possible.

In the puerperium, a fibroid should be let alone, unless there

is excessive bleeding or fever. In either case its removal, by hysterectomy or myomectomy, is indicated.

Prognosis.—The average mortality for the mother has been 50 per cent.; for the child 70 per cent. With reasonable care in management, these figures are much too high.

Ovarian cysts complicate pregnancy by a rapid growth, excessive pain or by twist on the pedicle. The abdomen is usually excessively distended, and this is the chief discomfort in pregnancy. The other complications are rare.

Cysts complicate *labor* depending on their size and position. If the cyst is in the upper abdomen, it does not cause obstruction. In the pelvis, it is usually a complete obstruction, unless it ruptures from pressure.

The *puerperium* may be complicated by: (1) Twist on the pedicle; (2) intracystic bleeding; (3) infection; (4) intestinal obstruction.

Management.—If the cyst is discovered prior to the sixth month of pregnancy, it is wise to remove it. This can be done without a greater percentage of miscarriage than normal (25 per cent.) and the great danger of twist on the pedicle is avoided. If seen after the sixth month, the patient should be allowed to go to term, unless abdominal distention is unbearable or the cyst twists on its pedicle.

In labor—in the upper abdomen no treatment is needed. For cysts impacted in the pelvis, spontaneous dislodgment does not occur. Choice of treatment lies between: (1) Vaginal section and removal of the cyst; (2) tapping; (3) abdominal cesarean section.

Vaginal section is not to be recommended, because of its difficulty and the danger of infection. Tapping is bad, because: (1) The cyst may be multilocular and hence imperfectly emptied; (2) hemorrhage; (3) sepsis; (4) the possibility of its being a dermoid and the consequent risk of peritonitis. Abdominal cesarean section with removal of the cyst is the best treatment.

In the puerperium, a cyst is most likely to twist upon its

pedicle. It should therefore be removed forty-eight hours after delivery, to forestall this and all other accidents.

Prognosis.—Maternal mortality has averaged 25 to 50 per cent., depending upon the form of treatment. Fetal mortality is 66 per cent. These figures should be very much reduced with intelligent management.

Effect of Age on Labor.—Labor is easiest between the ages of eighteen to twenty-five. Added years bring usually rigid cervix, inertia, eclampsia, abnormal presentations and the much greater likelihood of lacerations. There are exceptions to the rule, but nearly always labor after the age of thirty-five is a serious affair, and spontaneous delivery is the exception.

DYSTOCIA DUE TO THE FETUS AND ITS APPENDAGES

Overgrowth is not uncommon. The heaviest child on record weighed 28¾ pounds—its mother being a circus freak, seven feet, nine and one-half inches tall (the Nova Scotia giantess). Weights of twenty-five, twenty-three, twenty-two pounds and less have been reported. Any child weighing over eleven pounds is almost sure to cause severe dystocia.

Causes.—(1) Prolongation of pregnancy; (2) multiparity (successive children increasing in size); (3) large parents; (4) overeating during pregnancy.

Diagnosis.—Unless the child is gigantic, overdistention of the abdomen is not the rule. This symptom with a lack of fluctuation will exclude hydramnios, and twins can be diagnosed with considerable certainty by the *x*-ray. Antepartum fetometry will show the size and hardness of the fetal head, and especially its relation to the pelvic inlet, the size of which is known. The diagnosis is not always easy.

Difficulties.—(1) The large and usually hard head is often easier to deliver than the shoulders. With these comes the greatest difficulty. Many children die in labor, from asphyxia or injuries. Birth palsies involving the cervical nerves and brachial plexus are common.

Management.—If the patient is seen before labor, difficulty

can often be avoided by antepartum fetometry and induction of premature labor. If a patient has a history of very large children, she should never be allowed to go beyond term or even to full term. If the head will enter the pelvic inlet, it can usually be delivered by forceps, or even spontaneously; the difficulty with the shoulders may be met by trying to rotate them into a favorable diameter; bringing down the arm and shoulder easiest to reach by hooking the forefinger in the axilla, even fracturing the arm if necessary; traction on the neck by a towel placed around it rather than traction on the head; cleidotomy (cutting one or both clavicles) and finally episiotomy to save the perineum.

It is sometimes necessary to morcellate a gigantic child, but this is a formidable procedure.

If the head will not enter the superior strait, cesarean section is required.

Version, for an overgrown child, should not be considered, even in multiparæ.

Premature ossification of the cranium robs the cranial bones of their normal power of overlapping and moulding. If the head will enter the pelvic inlet, it can be delivered with forceps. If not, cesarean section is required.

Hydrocephalus is not uncommon. The most common cause is syphilis—though many cases occur without demonstrable cause. It is often associated with other malformations, most commonly spina bifida.

Effect on Pregnancy.—The child frequently dies, hence pregnancy is often prematurely interrupted. About one-third of the cases present by breech. Spontaneous rupture of the uterus is not infrequent.

Effect upon Labor.—A small hydrocephalus may be delivered spontaneously. Even a very large head, if not tense, may mould and descend the canal. During labor the head may rupture and the fluid be discharged. Most commonly, however, hydrocephalus presents an insuperable bar to spontaneous delivery.

Diagnosis.—If the head is large:—the cystic feel; the parchment-like cranial bones (craniotabes); the wide sutures and fontanels make the diagnosis easy. In moderate cases it may be necessary to insert the hand in the lower uterine segment, under anesthesia, and palpate the head as a whole.

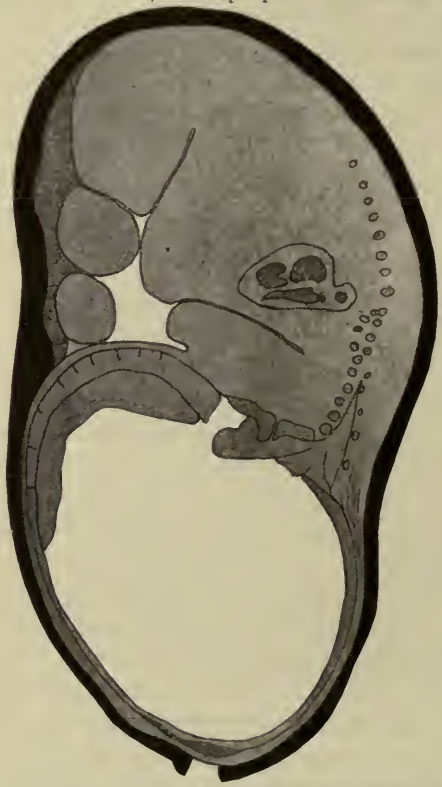


FIG. 105.—Section through a large hydrocephalic fetus, showing how the head can dangerously overdistend the lower uterine segment. (*Tarnier.*)

If a woman is in labor over two hours in the second stage with active pains, no engagement of the head and no obvious reason for the non-engagement, hydrocephalus must be suspected.

Differential Diagnosis.—From the macerated soft head of

a dead child. This latter is not much if at all enlarged, and the liquor amnii discharged when the membranes are ruptured, is red.

Treatment.—If the child is born spontaneously, it will usually die shortly. If it is deemed a fair risk, the spinal canal may be drained through the body of one of the lumbar vertebræ, by a canula, into the retroperitoneal space. Even fairly large heads may be so drained, and with further experience as to the permanent results, cesarean section may have a place in the treatment of hydrocephalus. Usually, however, the child cannot be considered, and craniotomy is required. The head may be punctured and labor allowed to terminate naturally, or the child may be extracted with the cranioclast (see obstetric operations). If it is presenting by the breech, the aftercoming head may be tapped through the foramen magnum, roof of the mouth or behind the ear—ordinary long, sharp-pointed curved scissors are sufficient armamentarium. If the child has a spina bifida, the cranium may be drained through the spinal canal.

Twin labors are usually uncomplicated, but 25 per cent. show some abnormality. The greatest danger in pregnancy is eclampsia (ten times as frequent); the greatest dangers in labor: (1) inertia uteri; (2) malpresentation; (3) impaction or locking of heads; the greatest danger after delivery is postpartum hemorrhage.

Presentation.—Most common is both heads (49 per cent.); next head and breech (32 per cent.).

Interval between delivery should be only a few minutes, but not more than one hour. A longer interval is due to mismanagement.

Size of twins is usually slightly under the normal, and they are rarely exactly of the same weight. Six pounds and five and a half is about the average.

Date of Labor.—On account of the overdistention of the uterus, twins are commonly born two or three weeks ahead of the calculated date.

Diagnosis.—A much overdistended uterus, without marked globular shape or fluctuation, should point to twins. It may be possible to outline two fetal bodies or heads; to hear two fetal heart beats of *different rates*. The *x*-ray will ordinarily show the two skeletons. The condition is often overlooked, and the diagnosis only made after the birth of the first child, when it is found that the uterus does not contract down, but remains near its original size.

Management is like that of a normal labor except that as soon as the first child is born, the cord should be cut between two ligatures; the patient should be given a dose of ergot by mouth or, better, aseptic ergot hypodermically, and the position of the second child determined at once. If this is not abnormal, the physician may wait for half an hour, or, more sensibly, rupture the second sac and deliver the child by version. As the birth canal is dilated and the child usually small, this is an easy matter. It is wiser to repeat the dose of ergot after the birth of the placenta, and to remain with the patient for at least two hours after delivery, on account of the danger of postpartum hemorrhage. The bulk of the placenta may make its extraction more difficult than the normal but with a little patience, manual extraction is not required.

Prognosis.—The fetal mortality is high; the maternal morbidity greater than in single births. Hydramnios of one sac is not uncommon. One of the children is often developed at the expense of the other, and the weaker does not survive.

Malpresentations.—Most of them have been discussed in the chapter on mechanism of labor. *Compound presentations* are common—most frequently head and hand; the hand may act as a wedge to prevent rotation, and it will be necessary to push it out of the way and apply forceps.

Presentations of the Umbilicus are managed like a transverse presentation, except that if the child is dead, evisceration is required.

Abdominal enlargements of the fetus, overdistended bladder, ascites, general anasarca, polycystic kidneys—all

require puncture of the abdomen and, except the bladder, evisceration as well.

Monsters are a law unto themselves. Loosely joined monsters (like the Siamese twins) may be born spontaneously; operative interference is almost always required, either dismemberment or cesarean section. The commonest of all monsters—anencephalus—is always born spontaneously.

Prolapse of the umbilical cord (funis) is not uncommon; the commonest time for it to occur is just after the membranes rupture. Hence it should be the rule to examine a patient at this time. It occurs once in about four hundred cases.

FIG. 106.—Prolapse of the umbilical cord. (*Dorland.*)

Degree of Prolapse.—(1) *Occult*, where the cord lies between the head and pelvic wall, but beyond the reach of ordinary examinations. This is one factor that explains stillbirth in normal easy delivery or in easy forceps operations. (2) *Forelying*—palpable through the os, but inside the membranes. (3) *Complete* prolapse into the vagina or even outside the vulva.

Etiology.—Most commonly seen in flat pelves, where the head does not accurately fill the pelvic inlet. Also in malpresentations, marginal placenta prævia and breech presentations (in these latter it is not serious).

Dangers.—To the mother, none; to the child, grave danger of asphyxia. The most dangerous position of the cord is *anterior*. The mortality to the child is forty to fifty per cent. in the artificially delivered cases; eighty per cent. in those delivered spontaneously.

Diagnosis.—If nothing can be felt by a vaginal examination,

and the heart beats are found to sink to 50 or 60 a minute during the pain and rebound to normal afterward, occult prolapse should be suspected, and if this slowing of the fetal heart is repeated, with every pain, rapid delivery, as soon as dilatation permits, is necessary to save the child. There should be no difficulty in diagnosis in either forelying or complete prolapse. The pulsating cord can be felt and in the latter case, often seen. Only the veriest tyro will mistake it for prolapse of the intestines, in ruptured uterus, although that mistake has often been made. Lack of pulsation in the cord does not always mean that the child is dead.

Treatment.—In forelying cord, the patient is placed in either the Trendelenburg posture (over a chair upended on the bed) or the knee-chest position, and kept there until dilatation is complete. As long as the membranes are unruptured, danger to the child is slight. When dilatation is complete (and it can be hurried by hydrostatic dilatation of the cervix) the child should be delivered, or at least drawn down well into the pelvic canal, with forceps, with the patient still in the Trendelenburg posture. Then she can be placed flat in bed.

Complete prolapse is best treated by thoroughly cleansing the cord and replacing it either manually or with a repositor (manually is much the best). The patient is placed in the Trendelenburg posture, and the cervix dilated either manually or with a metreurynter (bag). The child is delivered by forceps or version, with the patient still in the Trendelenburg position. If the cervix is not fully dilated, version should not be attempted, as it may be necessary to extract the child as soon as the version is performed. Except in multiparæ with roomy pelves, anesthesia is always necessary.

Cesarean section is only chosen where the desire of the parents for a living child outweighs any risk to the mother. If the child is dead, spontaneous delivery should be awaited, unless some condition on the mother's part demands more rapid delivery. In such a case craniotomy (and *not* forceps or version) is the method to be chosen.

Rupture of the cord is due to: (1) Precipitate delivery in the erect posture, where the cord may tear loose from the umbilical ring, or more commonly break about ½ inch from the child's abdomen; (2) it may be broken by efforts to free it from around the neck.

A ruptured cord does not usually bleed excessively. If there is a stump, it should be tied. If the cord has been torn out of the ring, the bleeding may be temporarily controlled by pressure. Then the retracted stump is pulled out of the umbilical ring with a tenaculum, transfixed with a sterile safety-pin and tied under the pin. Transfixion of the abdominal walls above and below the umbilicus is not to be recommended.

Long Cord.—An excessively long cord may be a source of danger from its tendency to prolapse, or to become tangled around the neck and extremities and secondarily compressed.

Short Cord.—May be actually short, or artificially shortened by coiling. To avoid difficulty, the cord must be at least 25 cm. long, to reach from the placental site to the vulva.

Symptoms.—If in the second stage of labor, the child's head recedes after each pain, if the patient complains of a dragging sensation, even acute pain, over the placental site, and if there is a marked slowing of the fetal heart during each pain, a short cord may be suspected.

Dangers.—(1) Asphyxia; (2) rupture of cord; (3) premature detachment of the placenta; (4) inversion of the uterus.

Treatment.—If the child's heart shows dangerous slowing, rapid delivery and the clamping and cutting of the cord, when it can be reached, as soon as the head is born.

Early Rupture of the Membranes (Dry Labor).—If the membranes are prematurely ruptured, labor does not always begin. If it occurs early in pregnancy the patient may go to term. Ordinarily, labor begins within three or four days. It is an undesirable accident, especially in primiparæ. The dilatation of the cervix is slower, is much more painful; artificial dilatation is often necessary. There is danger of sepsis from excessive manipulation. Forceps delivery is much more likely to be

needed. As soon as the cervix begins to be edematous, interference is indicated.

Late Rupture of the Membranes.—Rarely the membranes are so tough as to retard the advance of the head. Artificial rupture, when dilatation of the cervix is complete is the only treatment required. Occasionally the head is born with the membranes covering it—forming a "caul." The head must be freed at once to guard against asphyxia.

DYSTOCIA DUE TO ACCIDENTS IN LABOR

Fracture of the pelvis, rupture of the uterus and **lacerations** are all considered under the chapter on injuries of the birth-canal.

Hematoma may occur anywhere from the broad ligament to the vulva, most commonly in one labium majus and the perineum. Internal hematomata will usually be diagnosed by ordinary bimanual examination. They are globular, and will nearly always undergo spontaneous absorption. They may rupture at any time, with severe and possibly fatal hemorrhage.

Hematomata of the vulva are sausage shaped, purple in color, and the diagnosis is easy. Unless they become infected or persistently increase in size, they should be let alone. If opened, the incision should be large and the cavity packed tight. Any bleeding vessel should be tied but the bleeding is usually a general free oozing.

Inversion of the uterus is the rarest of all accidents in labor. It may occur either before or after the delivery of the placenta. It is commoner in primiparæ, and may occur as late as fifteen days after delivery. It may be complete, or incomplete (partial).

Causes.—(1) Ill-directed efforts at manual separation and extraction of adherent placenta; (2) spontaneously from the weight of the placenta adherent to the fundus, coincident with relaxation of the uterus; (3) traction on the cord, to extract the placenta; (4) traction of a short cord, just after delivery.

Symptoms.—(1) Sudden, profound shock after delivery; (2) the inverted uterus fills up the vagina, to the vulvar orifice or even projects from the vulva; (3) the cervix can be felt surrounding the upper portion of the uterus, like a collar; (4) the bulk of the fundus cannot be felt by abdominal palpation; (5) a deep groove can be felt extending across what remains of the fundus; (6) no uterine cavity can be demonstrated by a sound. Rectal examination may be used to feel the absence of a uterine body.

FIG. 107.—Mesial section of a case of inversion of the uterus. (*Swan.*)

Differential diagnosis from a fibroid polyp should be easy. In this case the body of the uterus can be felt, the distinguishing groove is absent; the uterine cavity can be demonstrated.

Treatment.—Occasionally spontaneous reposition occurs, but should not be awaited. It never occurs in a complete inversion. No delay should be caused by waiting for the patient to recover from shock. The sooner reposition is attempted, the easier it is. If the placenta is still attached, it should be removed. The whole hand is inserted in the vagina, and pressure made upward, forward and to one side, to escape the promontory. Pressure is made near the cervix and never on

the bulk of the uterus. If the cervix is torn on one side, pressure should be made on that side. The uterus is thus gradually curled back into shape. When replaced, the uterus and vagina should be packed with gauze, to prevent recurrence, which is removed in twenty-four hours.

If reposition is delayed, it may be necessary to cut the cervix to permit the uterus being replaced. This should never be necessary if reposition is begun at once. The cervix is cut posteriorly, the uterus replaced, the cervical cut repaired and the uterus and vagina packed to prevent recurrence.

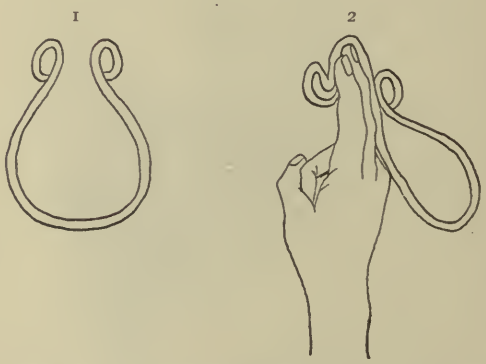


FIG. 108.—Method of beginning reposition of an inverted uterus. (*B. C. Hirst.*)

Prognosis.—The mortality from shock, hemorrhage, and sepsis is high, reported series giving 25 to 80 per cent.

Syncope.—Fainting after labor is not uncommon, and is most often due to fatigue, sudden change in intra-abdominal pressure and profound nervous impressions. Unless due to hemorrhage or embolism, and associated with air-hunger, it need not cause alarm.

Sudden death during and after labor is caused by embolism, hemorrhage, rupture of the uterus, shock from inversion of the uterus, and acute dilatation of the heart. If it occurs during labor, the child rarely survives more than a few

minutes. Living children have been delivered as long as two hours after the mother's death. In case of sudden death, immediate postmortem cesarean section is required, and the law will sustain the physician, irrespective of family consent. It is not necessary to listen for the fetal heart sounds.

Postmortem delivery sometimes occurs. It is due to accumulation of gases of decomposition, and not to uterine contractions. It has given rise to unfounded suspicion of burial alive.

Rupture of larynx and trachea, from excessive straining, has occurred. It is not serious, and the resulting emphysema is not dangerous. Immediate delivery, by forceps or version, is indicated.

DYSTOCIA DUE TO DISEASE

Eclampsia is fully considered under the toxemia of pregnancy.

Valvular disease of heart, even if compensated, is a serious matter in labor. Mitral disease is the most serious. The patient should be given tincture digitalis, minims 10 or digalen, minims 5 or digipuratum, one ampule hypodermically, every three hours during the course of labor; strychnin sulphate, gr. $\frac{1}{30}$ every four hours during labor; all straining should be avoided, and the labor terminated with forceps, under light anesthesia, as soon as the cervix is sufficiently dilated. Should signs of broken compensation appear—cyanosis, dyspnea, rapid and irregular pulse—rapid dilatation of the cervix and delivery by forceps or version is required. Moderate bleeding after delivery is not to be checked, as it is beneficial, often avoiding the need for venesection. The latter must always be considered, as the most dangerous time as directly after delivery, due to the extra amount of blood thrown back into the circulation, with the cessation of the function of the placenta. If no signs of broken compensation appear, the prognosis is favorable; otherwise there is considerable danger, and these patients require close watching and are not safe

for some weeks after delivery. Pleural effusions are common in puerperium.

Acute dilatation of the heart, from straining, is always to to be feared when the head is arrested at the vulvar outlet. Should the head not advance for one-half hour after the scalp becomes visible, forceps are indicated. The symptoms of acute dilatation are: (1) Shock; (2) cyanosis; (3) dyspnea; (4) rapid and irregular pulse; (5) enlargement of the area of the heart.

The *treatment* is immediate delivery, by forceps *without* anesthesia, and active stimulation with digitalin or digipuratum (1 ampule) strychnin, camphorated oil, pituitrin, and oxygen.

Tuberculosis of the lungs is not a cause of dystocia, except for the greater likelihood of pulmonary hemorrhage during the straining of the second stage.

Delivery during pneumonia, typhoid fever or other adynamic diseases is likely to be accompanied by profound shock, and steps must be taken to avoid or combat the shock.

CHAPTER XII

HEMORRHAGE

CLASSIFICATION

I. **Antepartum or in Pregnancy.**—(1) Abortion; (2) placenta prævia; (3) premature separation of normally situated placenta.

II. **Intrapartum or in Labor.**—(1) Placenta prævia; (2) premature separation of normally situated placenta; (3) lacerations (including rupture of the uterus); (4) rupture of hematoma.

III. **Postpartum (First Twenty-four Hours after Delivery).**—(1) Relaxation of the uterus; (2) lacerations; (3) retained or adherent placenta; (4) rupture of hematoma; (5) inversion of uterus.

IV. **Puerperal (after Twenty-four Hours).**—(1) Relaxation of the uterus (more rarely); (2) retained placenta, membranes or blood-clots; (3) dislodged clots at placental site; (4) displacements of the uterus; (5) puerperal hematomata; (6) tumors, benign or malignant.

ABORTION

Abortion has been discussed under the "premature termination of pregnancy," but for the sake of clearness, the control of the hemorrhage from abortion will be reviewed briefly.

Threatened abortion causes bleeding that is never dangerous. It can be controlled by rest, and *not* by packing the vagina, as the latter tends to make the abortion inevitable.

The bleeding from **inevitable abortion** is checked by packing the vagina alone, if the os is not dilated. If dilated, any pro-

truding or presenting portions of the ovum should be removed, and both uterus and vagina packed for twelve to twenty-four hours. The bleeding from incomplete abortion may be very serious. If the patient's condition permits it, the uterus is emptied and both uterus and vagina packed for twelve to twenty-four hours. If her condition is too serious for immediate interference, pack both uterus and vagina and remove the remains of the ovum, with the packing, twenty-four hours later, after she has reacted from her primary shock.

PLACENTA PRÆVIA (UNAVOIDABLE HEMORRHAGE)

Placenta prævia is the development, wholly or in part, of the placenta in the lower uterine segment—the dilatable portion of the uterus in labor.

Frequency.—On an average once in 1000 cases (series vary from 1–1500 to 1–300 cases), and ten times as frequently in multiparæ as in primiparæ.

Causes.—Low attachment of the ovum, due probably to a pre-existing endometritis, at or near the internal os uteri.

Varieties.—(1) *Central* (the most dangerous, but occurring in less than one-fifth of the cases) where the center of the placenta is approximately over the internal os; (2) *partial* (the most frequent of the serious forms) where the os is entirely covered, the placenta attached on both sides, but the bulk of the organ is to the right (usually); (3) *marginal*, where a flap of placenta extends over the os, but is not attached on the far side; (4) *lateral*, where the edge of the placenta comes nearly or quite to the edge of the canal.

Marginal and *lateral* placenta prævia are the commonest varieties, and the least serious.

Symptoms.—(1) Sudden, causeless, painless, profuse bleeding, occurring at any time in pregnancy, from the third month on, but most frequently in the seventh and eighth months. The bleeding tends, naturally, to increase as the patient nears term. A continuous, slight dribbling of blood is called

stillicidium sanguinis. The more nearly central the placenta, the more severe and the earlier the onset of the bleeding, as a rule.

(2) Usually the cervix is soft and boggy, and the os is somewhat dilated.

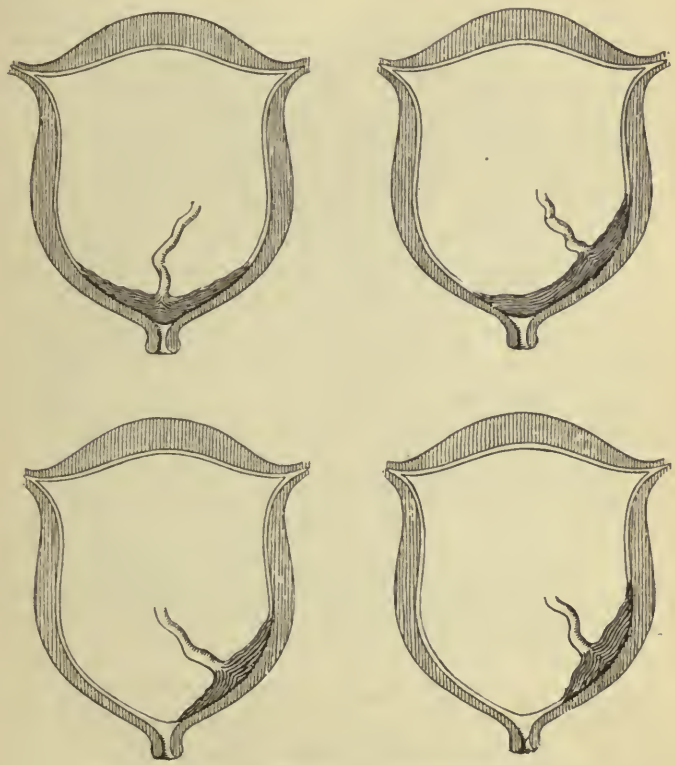


FIG. 109.—Varieties of placenta prævia.

(3) Through the os can be felt the rough maternal surface of the placenta.

Differential diagnosis from premature separation of a normally situated placenta.

Placenta Prævia	*Premature Separation*
1. Begins any time in pregnancy.	1. Begins in last month or early labor.
2. No pain.	2. Pain at placental site, later becoming general.
3. Uterus does not become tense.	3. Uterus tense.
4. External hemorrhage profuse.	4. External hemorrhage usually slight.
5. Symptoms proportionate to loss of blood.	5. Symptoms more severe than loss of blood would explain.
6. Os patulous or dilated.	6. Os not dilated, unless in labor.
7. Placenta can be felt.	7. Placenta cannot be felt.
8. Fetal movements and heart-sounds usually unchanged.	8. Fetal heart-sounds and movements usually disappear.

Prognosis.—The frequency of abortion or miscarriage is about 60 per cent. Usually slight hemorrhage in labor is more severely felt by the patient, due to the blood already lost in pregnancy. The maternal mortality averages about eight or ten per cent; the fetal mortality about fifty-five to sixty per cent. The chief dangers to the mother are hemorrhage and sepsis—the latter from manipulations required in delivery and the accessibility of the placental site.

Treatment.—Prior to the seventh month of pregnancy, the bleeding is so rarely serious, that it is justifiable to adopt an expectant policy, but only where the patient is so situated that she can be reached without delay, should serious hemorrhage begin. A patient with placenta prævia is safe only in a hospital, and is not safe in her own home.

Prior to the seventh month, if moderate bleeding occurs, it can usually be checked by putting the patient to bed, at complete rest. If severe bleeding occurs, and the os is not dilated, it can be checked by a firm vaginal tampon, of sterile gauze.

Technic of Packing.—(1) The patient is placed across the bed, with her hips over the edge, her feet on two chairs. (2) The perineum is retracted with a Sims' speculum. (3) The vagina is packed *firmly* with sterile gauze, preferably in a long strip, packed in as tightly as possible, especially in the

upper part of the vagina. (4) A large thick square of sterile gauze is placed over the vulva, and is held in place by a T bandage.

Treatment at Seventh Month.—The danger of fatal hemorrhage is now so great—the child being also viable—that

FIG. 110.—Case of placenta prævia with vagina properly packed with gauze. (*Dickinson.*)

induction of labor is advisable. In *central* and *partial* placenta prævia the technic is as follows:

(1) The patient is placed in the lithotomy position on an operating table and anesthetized.

(2) The physician prepares himself as carefully as to hands, gown and gloves as for a major operation.

(3) Insert one hand in the vagina, after thorough vaginal cleansing with tincture of green soap, hot water, lysol solution (one dram to two pints).

(4) Dilate the cervix manually, inserting one finger after another until the cervix can be stretched over the knuckles.

(5) Feel on the patient's left side for the edge of the placenta, rupture the membranes, grasp the anterior leg, perform podalic

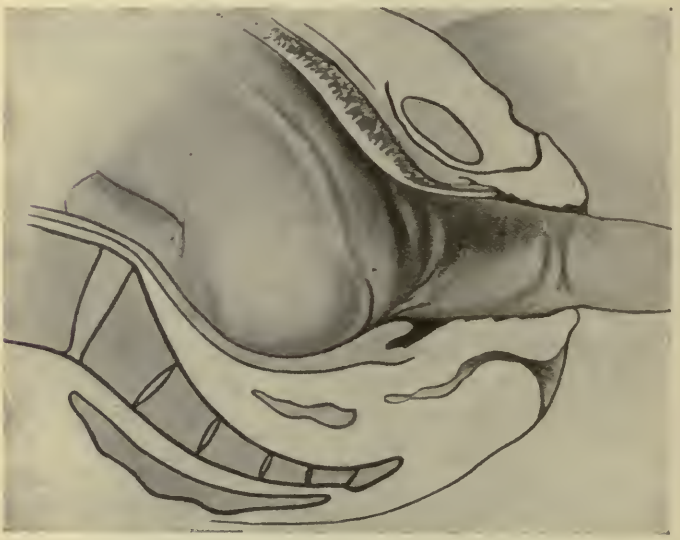


FIG. 111.—The control of hemorrhage in placenta prævia by impaction of the breech, after podalic version. (*De Lee.*)

version, and pull the leg down until the knee is outside the vulva (showing that the breech is impacted in the cervix).

(6) Withdraw the anesthetic, and wait one to two hours for further dilatation, delivering the child as an ordinary breech presentation. Unless the physician is confident of his ability to perform the dilatation and version quickly, he had better not attempt it, as until the breech is impacted in the cervix, the hemorrhage is very profuse. Usually all bleed-

ing ceases when the breech is impacted, but the patient must be closely watched for signs of shock as, sometimes the bleeding continues internally and may require immediate delivery. Too rapid extraction of the child may rupture the lower uterine segment, and this rupture, spontaneously, is not rare.

Marginal and *lateral* placenta prævia so rarely cause bleeding at this time, that they need not be considered here.

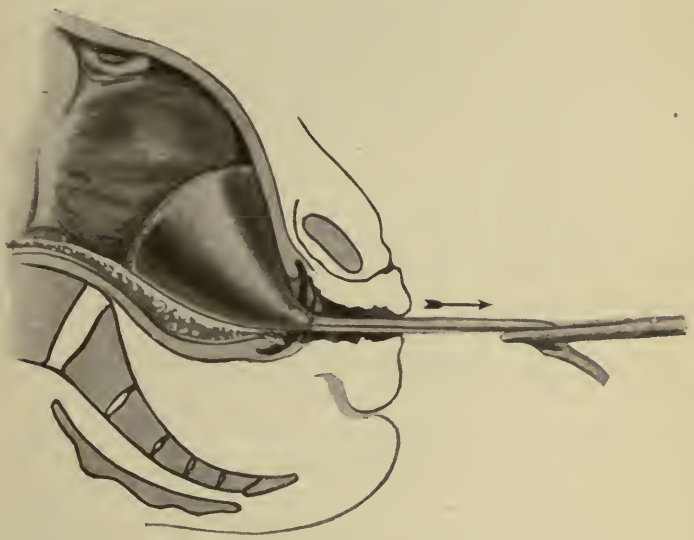


FIG. 112.—The use of a Voorhees bag in controlling the bleeding in placenta prævia. (*De Lee.*)

Management of Placenta Prævia at or near Full Term.—If *central* or partial placenta prævia have not given symptoms before this, the first hemorrhage is always sudden and very profuse. It may be temporarily checked by vaginal packing, as already described. When the physician has had time to make adequate preparations, he may proceed in one of several ways.

(1) Allow the child's head to push the packing out, if the patient is in labor. This is the *Wigand treatment*, is reasonably safe for the mother but not for the child.

(2) When all preparations are made, proceed as described in the induction of labor, at the seventh month, although this is now a much more formidable procedure, and should not be attempted except in multiparæ. Much longer time is required for safe delivery than at the seventh month.

(3) The *metreurynter* or rubber bag, distended with sterile water and placed either *inside* or *outside* the membranes. The former is better. The method is difficult of application in either central or partial placenta prævia. Gentle traction (one-half pound) is made on the tube until the bag slips through the cervix.

(4) The *forceps*, after the cervix is sufficiently dilated. Can rarely, if ever, be used in central or partial cases.

(5) Vaginal *cesarean section* has a number of advocates, but the operation is difficult, the bleeding is very severe, and the operation is one for experts in a well-equipped hospital only.

(6) Abdominal *cesarean section* has a well-defined field. It should never be necessary in lateral or marginal cases. It is indicated in central placenta prævia in both primiparæ and multiparæ; in partial placenta prævia in primiparæ; and in any case where an obstacle exists (contracted pelvis, very rigid cervix, etc.) to an easy vaginal delivery, abdominal cesarean section should be the method of choice, but never extraperitoneal cesarean section, on account of the hemorrhage attending the incision in the lower uterine segment.

Treatment of Marginal or Lateral Placenta Prævia.—Many cases give such slight bleeding that they require no treatment. If bleeding is severe enough to cause alarm, it is nearly always in labor, when the cervix is fairly well dilated, and can be controlled as follows:

(1) Simple rupture of the membranes, to allow the head to descend and make pressure, is often enough.

(2) The metreurynter, placed *inside* the membranes and distended with sterile water.

(3) Forceps.

(4) Podalic version—in multiparæ only.

Stimulation.—In ordinary cases, no stimulation is required before delivery, but during delivery, especially by podalic version it may be needed. Hypodermoclysis of 500–1000 mils of salt solution, intravenous injection of a similar amount, or transfusion (preferably by the sodium citrate method) of 250–750 mils is best, because the patient needs fluid in the circulation to replace the blood lost, rather than hypodermic stimulation. In very severe cases it may be required to pack the vagina, for temporary control of bleeding, and to perform transfusion (500 mils) before any attempt at delivery can be made. *After delivery*, nearly all cases require stimulation—hypodermoclysis, intravenous injection of salt solution, transfusion, hypodermics of digalen ♏10 or digipuratum 1 ampule every three hours; strychnin sulphat. gr. $\frac{1}{30}$ every three hours; nitroglycerin gr. $\frac{1}{100}$ every three hours; bandaging extremities and external heat, and after reaction has set in, a hypodermic of $\frac{1}{4}$ grain of morphin, to control the restlessness of the acute anemia.

Control of Bleeding after Delivery.—Because the placental site is in the lower uterine segment—the dilated and paralyzed portion—the greatest danger after delivery is postpartum hemorrhage. The contraction of the upper portion of the uterus has little influence upon the source of the bleeding. Hence ergot and pituitrin cannot be depended upon to control bleeding. Every case of placenta prævia, except those delivered by abdominal cesarean section, should have the uterus and vagina tightly packed with gauze (further supported by a large pad of gauze externally and a T binder) for at least twenty-four hours after delivery. No matter how favorable the appearance of the case after delivery, the precaution should not be neglected. Very moderate postpartum hemorrhage, in addition to the blood already lost before and after delivery, may be fatal.

PREMATURE SEPARATION OF A NORMALLY SITUATED PLACENTA (ABRUPTIO PLACENTÆ; ACCIDENTAL HEMORRHAGE

Separation of the placenta, either partial or complete, at its normal site is considerably less common than placenta prævia. Its frequency, in cases serious enough to demand attention, is about 1–2000 cases.

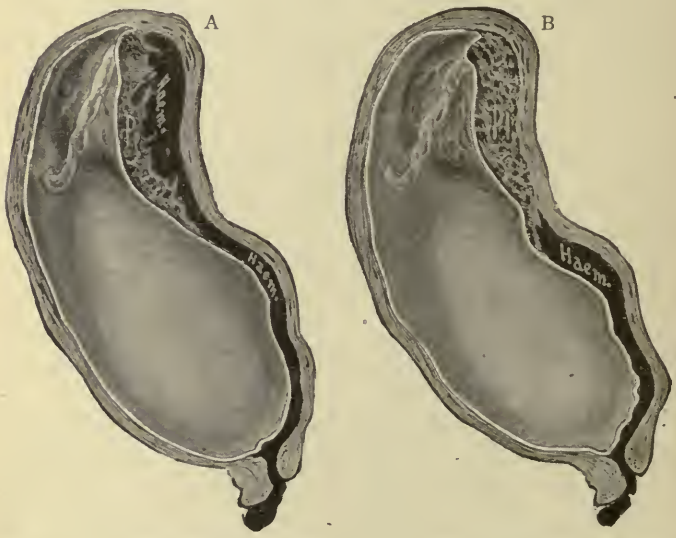


FIG. 113.—Premature detachment of a normally situated placenta. (*American Text-book of Obstetrics.*)

Causes.—(1) Traumatism: falls; coitus in the last month of pregnancy; jolting of a carriage or automobile; traction of a short cord. (2) High maternal blood-pressure in toxemia. (3) Placental or decidual disease. Cases often occur without any demonstrable cause, and the accident is more frequent in multiparæ.

Degree.—Either upper or lower edge of the placenta may be separated, or the central portion be detached, with a large

hematoma behind it, or rarely the entire organ may be separated. The bleeding may be (1) frank—escaping externally, but never without some retention in the uterine cavity —or (2) concealed—by the center or upper edge of the placenta being detached; or by the cervix being blocked by the presenting part or a clot; and very rarely by the blood flowing into the amniotic sac through a high rupture of the membranes. The bleeding is at first concealed and secondarily only frank. Only about half the cases show any external bleeding.

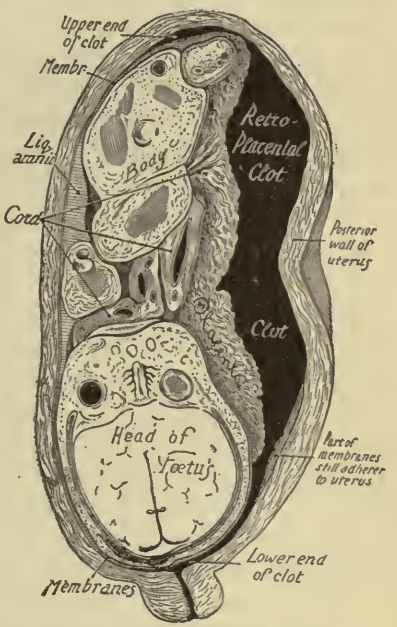


FIG. 114.—Mesial section of a case of premature detachment of the placenta, showing the large amount of blood retained in the uterine cavity. (*Pinard and Varnier.*)

Symptoms.—Mild cases may give only slight pain, no signs of bleeding and the condition is recognized only by the expulsion of considerable masses of blood-clot after the placenta is expressed. The typical severe case begins in the last month of pregnancy or in early labor. There is first severe pain over the placental site, rapidly becoming diffuse over the entire uterus. The uterus is increasingly tense. If the patient is in labor, the pains become less effective, and are finally masked altogether by the intense constant pain of the distended uterus. The patient begins to show the signs of internal bleeding—air-hunger, rapid pulse, ringing in the ears, pallor and sweating. There is moderate external bleeding in

about half the cases, not sufficient in amount to explain the visible effects of hemorrhage.

It may be possible to feel the bulging of the uterus caused by the retroplacental clot.

Differential Diagnosis.—(1) *Diagnosis from placenta prævia* has been given under that head. (2) *Rupture of the uterus* occurs late in labor, the membranes are ruptured, shock is immediate, and the presenting part recedes, even into the peritoneal cavity. *Rupture of the circular sinus of the placenta* cannot be diagnosed from premature separation of the placenta, and requires the same treatment.

Prognosis.—With complete detachment of the placenta the mortality for the mother is 50 per cent.; for the child 95 per cent. Partial detachment will give more favorable results, greatly dependent upon the promptness of treatment and the skill of the physician.

Treatment.—Vaginal packing is useless in controlling the hemorrhage. The chief indication is to deliver the patient as rapidly as consistent with a minimum of shock. If the cervix is not dilated, but is soft and dilatable, manual dilatation and podalic version or forceps will give the best results. In primiparæ with a rigid cervix or in any case where an obstacle exists to an easy vaginal delivery, abdominal cesarean section must be considered. It may be necessary to remove the uterus to control the persistent bleeding.

Vaginal cesarean section is more difficult but in multiparæ at least is indicated where the cervix is the main obstacle to delivery.

Ergot and *pituitrin* have been recommended, but are both unsafe until after the child is delivered.

Rupture of the membranes in partial cases, excites the uterus to effective contractions and hastens the dilatation of the cervix. If dilatation of the cervix has been performed, and forceps applied, and the head will not come through the cervix, further action is governed by the patient's condition. If not alarming, time can be taken for intermittent traction with

the forceps; if she is in imminent danger, craniotomy is indicated.

Stimulation.—All cases of premature detachment of the placenta will require the same stimulation as placenta prævia. After delivery, the uterus and vagina should be packed, in every case, as a preventive of postpartum hemorrhage.

Hemorrhage from rupture of the uterus is controlled in one of two ways, depending upon whether the rupture of the uterus is complete or incomplete.

Complete rupture of the uterus requires abdominal section and hysterectomy below the site of the tear.

Incomplete rupture is nearly always anterior, under the bladder. The bleeding can be perfectly controlled by packing the lower uterine segment and the vagina with sterile or iodoform gauze.

Hemorrhage from rupture of a hematoma requires packing only, unless the hematoma is in the layers of the broad ligament. This is associated with rupture of the uterus, in most cases, and requires the same treatment.

POSTPARTUM HEMORRHAGE

Postpartum hemorrhage is the name given to any hemorrhage occurring within twenty-four hours after the delivery of the placenta, but by usage restricted to that due to either: (1) Relaxation of the uterus or (2) lacerations of the birth-canal.

The pregnant woman is fortified against a loss of blood by an oversupply, so that a loss of blood, serious to a non-pregnant woman, is borne without symptoms. She is normally protected against bleeding after delivery by: (1) The high fibrin content of the blood (favoring rapid clotting) and (2) the firm contraction of the uterine muscle.

The average loss of blood is eight to ten ounces (300 gm.). Anything up to one pint (500 gm.) is borne without symptoms, and anything over one pint may be considered pathologic although a loss of a quart (1000 gm.) is usually well borne.

Causes of Relaxation of the Uterus.—(1) Fatigue from a long labor; (2) overstretching of the muscle, due to hydramnios or twins; (3) too much pituitrin in labor; (4) anesthesia (chloroform or ether); (5) premature extraction of the placenta; (6) retention of portions of placenta or membranes. (7) It is much more common in high altitudes, and also in the tropics.

Symptoms.—(1) Expulsion of blood, in jets, of a few ounces every few seconds, and more rarely a continuous flow. (2) The uterus is soft, relaxed, enlarged and distended with clots, and is difficult to outline by palpation through the abdominal wall. The contrast to the firm, well-outlined uterus is very marked. (3) If the loss of blood is sufficient, the constitutional signs of hemorrhage appear—pallor, rapid pulse, leaky skin and air-hunger (yawning or sighing). Rarely there is a very profuse outpour of blood, from which the patient may die in a few minutes.

Diagnosis.—If a patient is bleeding profusely after delivery and the uterus by abdominal examination, is hard and firm, the bleeding is almost surely due to laceration. If the uterus is soft and boggy and ill-defined, the bleeding is due to relaxation. *The pulse is not a fair guide to the severity of the hemorrhage.* It may remain slow and full, even with a serious hemorrhage, and then suddenly disappear.

Treatment.—The routine treatment of postpartum hemorrhage from relaxation of the uterus is as follows:

(1) Remember that most of these cases are easily controlled and do not get alarmed.

(2) Give hypodermically or intramuscularly 1 ampule of pituitrin and 2 of aseptic ergot (or 30 minims of ergone).

(3) Remove the abdominal binder, if applied, and knead the uterus briskly.

Most cases will be controlled by these means alone. If anything further is required:

(4) Make sure the uterine cavity is empty of blood-clots, placenta or membranes, by inserting the *aseptic gloved* hand

and exploring, at the same time rotating the hand somewhat roughly, to stimulate the muscle to contract.

(5) Bimanual compression of the uterus, by one hand in the vagina and one on the abdomen.

(6) Very hot intra-uterine douche of sterile water, 120° F.

(7) Pack the uterus and vagina with sterile gauze.

Technic of Packing.—(1) Patient is arranged across the bed, with her feet on two chairs, and her hips over the edge of the bed.

(2) She is carefully cleansed, and the cervix caught by a 2 double tenacula and pulled down.

(3) With Emmet curetment forceps, a long strip of sterile gauze is carried into the uterus, up to the fundus. The gauze is then packed in, in layers, until the uterine cavity is full.

(4) The vagina is packed with similar strip and the packing is held in by a vulvar pad and T bandage.

FIG. 115.—Correct packing of the uterus and vagina for postpartum hemorrhage. (*Bumm.*)

(5) The entire packing can be removed after twelve hours; it should be withdrawn slowly, over a period of fifteen or twenty minutes, and it is rarely necessary to repack.

Packing is the surest method of controlling the bleeding, but is not to be used unnecessarily, because of the danger of sepsis, though this is slight if the technic is properly carried out. Styptics, like Monsel's solution, should not be used. The resulting clots are firm and putrescible, and sepsis is likely. Ice to the abdomen or vinegar carried in the uterine

cavity on sterile gauze have been superseded by more modern methods. Very obstinate cases are sometimes checked by firmly packing the uterus, and closing the cervix over the pack by temporary sutures, removed in twenty-four hours. It is doubtful if this method has any advantage over the combined uterine and vaginal packing, held in by a T bandage.

Otherwise uncontrollable cases have been stopped by the Momburg belt—a five-foot length of rubber tubing placed

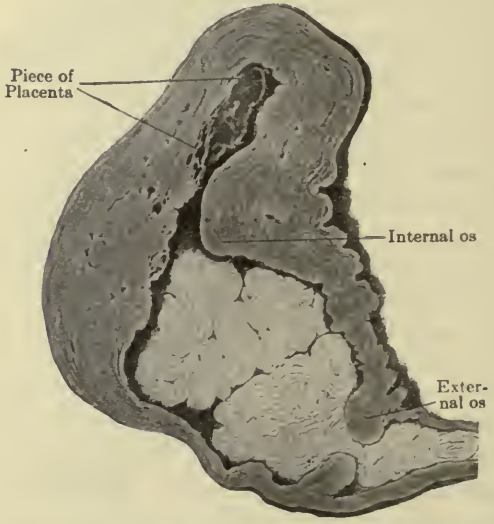


FIG. 116.—Faulty packing of uterus and vagina for control of postpartum hemorrhage. (*Bumm.*)

around the abdomen, *above* the fundus uteri, and pulled tight enough to stop the femoral pulse. This method has some danger of shock, is excessively painful, and may injure the intestines or kidneys by pressure. It has no advantage over the much easier and more rational compression of the aorta by the clenched fist.

Faradism of the uterine muscle by a portable electric battery has some advocates, but is not worth while. It takes some

time, which can ill be afforded, to connect the apparatus, and there is great risk of infection, as the uterine pole is in the uterine cavity.

No physician should attend a labor case without having the necessary implements for packing the uterus, sterile gauze for packing, the apparatus for intravenous injection of salt solution, and a properly equipped hypodermic set.

Stimulation.—Most of the cases will be controlled before there is any need for stimulation. If needed, however, the same stimulation as in placenta prævia is indicated. The patient must not be left until her condition is satisfactory, and danger of bleeding past.

Prognosis.—Death from hemorrhage due to relaxation of the uterus is rare. Severe postpartum hemorrhage occurs in about 2 per cent. of labors, but fatal cases not oftener than one in 5000 labors. A greater danger is septic infection from too enthusiastic intra-uterine manipulations, with questionable asepsis.

Lactation is often delayed, and subinvolution of the uterus is common.

HEMORRHAGE DUE TO LACERATIONS OF THE BIRTH-CANAL

Profuse bleeding with a firmly contracted uterus means, usually, laceration. This is particularly likely in cases of hurried, instrumental delivery, and is rare in spontaneous deliveries, that were not precipitate. The hemorrhage from lacerations is usually free for a few moments, and then ceases spontaneously. It may be very serious, however, and sometimes fatal.

The site of the injury is most commonly on the anterior vaginal wall, near the clitoris and urethra; next in the cervix, and least commonly, in the perineum.

Diagnosis.—The patient is placed across the bed with her feet on two chairs, her hips over the edge of the bed. She is

carefully cleansed externally, and the area around the clitoris and urethra is inspected for tears; the cervix is examined through a bivalve speculum or pulled down with tenacula, and the posterior vaginal wall inspected, with the bivalve speculum or a Sims' speculum holding up the anterior vaginal wall.

Treatment.—If the hemorrhage is not too profuse, make gentle pressure with a gauze sponge, for a few minutes, and it will usually cease. If it is alarming, the method of treatment depends upon its source.

Anterior Vaginal Wall, Clitoris and Urethra.—A continuous catgut stitch, making pressure with a sponge to control the blood temporarily, will close the wound, and permanently stop the bleeding.

Cervix.—This is the site of the most serious tears, and the source of the most dangerous bleeding. If forceps have been applied, prior to complete dilatation and effacement of the cervix, the tear may extend through the cervical muscle into the lateral vaginal vault, the broad ligament or the connective tissue behind the bladder—really a rupture of the uterus. This bleeding from severe tears can best be controlled by packing, renewed at intervals of twenty-four hours. If the cervix is torn laterally, the bleeding may be controlled by sutures or better by packing around the cervix on the injured side, well up into the vaginal vault, with sterile gauze—the so-called ring tampon.

In the perineum, the bleeding is most likely from a single vessel, which can be tied. If it is a general ooze, vaginal packing with a vulvar pad and T binder for a few hours, will check it.

Bleeding from retained or adherent placenta is easily checked by the expression or extraction of the placenta, and the dose of ergot should not be repeated until the placenta is delivered.

Bleeding from inversion of the uterus cannot be checked until the uterus is replaced. It is not enough to be serious;

the profound shock seen in these cases is due to the inversion, and is out of all proportion to the amount of blood lost.

PUERPERAL HEMORRHAGE (AFTER TWENTY-FOUR HOURS)

Relaxation of the uterus is uncommon at this time but may occur as late as four weeks after delivery. The bleeding is controlled as already described under postpartum hemorrhage, except that these late hemorrhages from relaxation almost invariably require packing of the uterus and vagina.

Retained portions of the placenta or membranes do not always cause bleeding. When they do, the bleeding is likely to be moderate in amount, and serious only through its long continuance. Any persistent moderate bleeding after delivery, without obvious cause, should indicate exploration of the uterine cavity. Even if the placenta was examined after its expulsion, and found entire, a placenta succenturiata may have been retained. When the membranes are retained, spontaneous expulsion within forty-eight hours is the rule, and they rarely justify efforts to extract them. Copious discharge of blood-stained serum, with occasional clots, nearly always indicates blood-clots in the upper vagina or uterus, and requires exploration of the uterine cavity. The bleeding from all these causes ceases promptly when the offending tissue is removed.

Dislodged clots at the placental site nearly always follow sudden exertion, such as getting up too soon. The bleeding is very sudden and profuse, and this cause can be inferred if there is a history of exertion followed by profuse bleeding from a well-contracted uterus. Prompt packing of the uterus and vagina will control it.

Backward displacement of the uterus, when involution has proceeded far enough to allow it to slip behind the promontory, will cause annoying slow bleeding. The condition is easily diagnosed by bimanual examination, and the uterus should be replaced, with the patient in the knee-chest position.

Atony of the uterus, causing moderate bleeding without demonstrable cause, and the uterine cavity being found empty

on exploration, is best checked by ergot thirty drops three times daily, with a hypodermic of pituitrin ½ ampule twice daily (for 2 days).

Fibroids sometimes cause serious bleeding. If the tumor is a polyp, it should be snared or twisted off. If intramural, and styptics as described under atony do not check the bleeding, hysterectomy or myomectomy may be necessary. Fibroids always prolong the bloody lochia, but serious hemorrhage is most likely in a case of polyp.

Cancer or chorionepithelioma are rare but possible causes of bleeding. The uterus is explored, the evacuated material examined microscopically, and, if malignant, panhysterectomy is indicated.

CHAPTER XIII

INJURIES OF THE BIRTH-CANAL

CLASSIFICATION

I. **Injuries to the Pelvis.**—(1) Fracture or separation of the symphysis; (2) fracture or separation or sprain of sacro-iliac joints; (3) fracture of ramus of pubes; (4) fracture of coccyx.

II. **Rupture of the Uterus.**—(1) Complete (communicating with the peritoneal cavity); (2) incomplete (the peritoneum still intact).

III. **Lacerations of the Cervix.**—(1) Unilateral (open or submucous); (2) bilateral (open or submucous); (3) stellate (open or submucous); (4) annular detachment.

IV. **Lacerations of Anterior Vaginal Wall.**—(1) Clean cuts of mucous membrane; (2) open or submucous tears of muscle of urogenital trigonum.

V. **Lacerations of the Perineum.**—(1) Tears of levator ani; (2) tears of deep transversus perinei; (3) tears of anterior and posterior layers of triangular ligament; (4) tears of the bulbocavernosus; (5) tears of the superficial transversus perinei; (6) tears of sphincter ani (complete tear).

Further divisions into:

(1) Complete tear (involving sphincter ani); (2) incomplete (*not* involving sphincter); (3) central perforation of the perineum; (4) laceration and abrasion of labia.

VI. **Fistulæ.**—(1) Vesicovaginal (on anterior vaginal wall); (2) ureterovaginal (in vaginal fornix); (3) rectovaginal (on posterior vaginal wall).

INJURIES TO THE PELVIS

These are almost always the result of attempts at forcible delivery, and are most common in justominor pelves, where forceps have been used too forcibly. Fracture of the symphy-

sis, sacro-iliacs or ramus are rare. Usually an audible snap can be heard, or the sudden giving way of the pelvis distinctly felt. The gap in the bone can be palpated. Delivery should be completed with as little violence as possible, and the pelvis immobilized by a canvas binder or better broad strips of adhesive plaster. The after-care is difficult, but is made somewhat easier by having the patient on a Bradford frame —a sort of extra cot placed on the bed, the floor of which is made of broad strips of canvas, laced to the frame.

In injuries to the symphysis, the subpubic ligament is often not torn. This masks the accident, which is only discovered when the patient is unable to walk when she gets out of bed. A hematoma commonly forms over the site of the injury, and these two factors should point to injury of the symphysis, if it was not diagnosed at the time of its occurrence.

SPRAINED OR LOOSE SACRO-ILIAC JOINT

A sprained or loose sacro-iliac joint gives the patient extreme discomfort when she begins to resume her normal activities. There is intense backache, over the affected joint, worse on walking or standing. The treatment is a binder or corset, designed to immobilize the hips. Recovery is slow, usually over four to six months.

Fractures of the pelvic joints or bones are serious, especially if there has been a secondary laceration into the vagina. The great danger is infection.

FRACTURE OF THE COCCYX

This is seen most commonly in elderly primiparæ, with justominor pelves. It is not serious in labor, and hence will be considered in the chapter on pathologic sequelæ of childbirth.

RUPTURE OF THE UTERUS

Frequency.—About 1 in 2500 cases. About eight times as frequent in multiparæ, and the years of greatest frequency are thirty to forty. Obesity and syphilis both predispose to uterine rupture.

Varieties.—(1) Complete, where the peritoneum is torn through and the uterine cavity communicates with the peritoneal cavity. (2) Incomplete, where the peritoneum is uninjured.

Causes.—*Predisposing* causes are: (1) Repeated overdistention of the uterus, such as many previous pregnancies, polyhydramnios or twins; (2) previous cesarean sections or other operations involving the uterine wall; (3) diseased uterine muscle (from old inflammation); (4) congenital ill-development of uterus; (5) fibroid tumors; (6) placenta prævia.

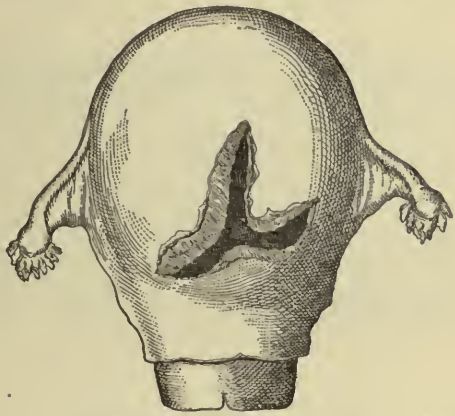


FIG. 117.—Complete rupture of the uterus. (*Auvard.*)

II. *Exciting causes* are: (1) Overdistention of the lower uterine segment in neglected obstructed labor; (2) perforation by hands or instruments; (4) ill-advised attempts at podalic version; (4) administration of ergot or pituitrin, if any obstacle to delivery exists.

Site of Rupture.—Most commonly in the lower uterine segment, running transversely, with usually an L-shaped extension into the broad ligament or vagina. Spontaneous rupture may occur in the upper portion of the uterus (as after previous cesarean section) or transversely across the fundus. In primiparæ, the cervix may tear anteriorly up to or through the vesico-

uterine reflection of peritoneum. The tear is usually very ragged and irregular, the edges edematous and infiltrated with blood. Incomplete rupture is most often anteriorly through the cervix to the vesico-uterine peritoneum, or laterally into the layers of the broad ligament.

Symptoms.—*Premonitory.*—(1) Long-continued labor with no advance of head, or with malpresentation; (2) overdistention of the lower uterine segment; (3) high position of Bandl's contraction ring; (4) just before rupture, the appearance of an area of great tenderness to palpation, over the lower uterine segment.

Bandl's contraction ring is the sharply defined muscular ridge or line between the contracting upper portion of the uterus and the dilated, paralyzed, overdistended lower portion of the uterus. It is plainly visible and palpable, running obliquely across the lower abdomen. Bandl's contraction ring normally marks the site of the coronary vein of the uterine wall, or the beginning of the firm attachment of the peritoneum; it is the boundary between the contracting and dilatable portions of the uterus. The nearer the contraction ring is to the umbilicus, the more imminent the danger of rupture of the uterus.

Symptoms of Rupture.—(1) Sudden sharp stabbing pain; (2) shock; (3) usually surprisingly little external bleeding; though the intraperitoneal hemorrhage may be very profuse; (4) cessation of labor pains; (5) recession of the presenting part; (6) possible escape of the fetus into the abdominal cavity; (7) intra-uterine examination, in this case or after the child is extracted, will reveal the rent, with or without prolapse of the intestines into the uterine cavity.

Diagnosis from premature separation of the placenta should not be difficult. Rupture occurs late in labor; separation early. Rupture of the uterus has the premonitory signs detailed above, they are absent in separation. In rupture the uterus is usually diminished in size; in separation, increased. The tear is palpable in rupture, and none can be felt in separa-

tion. The outline of the abdomen, with a moderately distended bladder looks not unlike a high contraction ring, but the absence of all serious symptoms, fluctuation over the bladder and the catheter should clear up the diagnosis at once. The most serious error that can be made is to mistake the over-distended lower uterine segment for the sluggish uterus in inertia, and attempt to stimulate the muscle to further contraction, by pituitrin or ergot. A careful consideration of the premonitory symptoms should make such a mistake impossible. Rupture of the uterus is possible with few if any symptoms at the time of rupture. Spontaneous recovery may result (very

FIG. 118.—A full bladder in labor. The line marking the fundus of the bladder is strikingly like the high contraction ring of Bandl. (*De Lee.*)

rarely) or an abdominal abscess or peritonitis develop. In any case when the physician has reason to suspect rupture of the uterus, a careful exploration of the uterine cavity should be made after delivery, to prevent overlooking such an injury, until septic peritonitis appears and makes any treatment useless.

Prognosis.—Ruptures of the anterior wall or fundus are more serious than those of the posterior wall. Incomplete rupture is naturally safer than complete. Hysterectomy and drainage, except in incomplete cases, is much safer than expectancy with irrigation and drainage. The maternal mortality is 50 to 75 per cent., depending upon the form of treatment; the child usually dies at the time of rupture.

Treatment.—Preventive treatment, to correct the abnormality responsible for the obstruction to delivery, is of course the obvious way of avoiding the accident—and most cases of uterine rupture are avoidable. The dictum of "once a cesarean, always a cesarean" is not borne out in practice. The great majority of such patients can, if the obstruction to delivery is not absolute, deliver themselves spontaneously under proper management. The treatment of the rupture depends on whether the rupture is complete or incomplete, its situation, and the length of time that had elapsed since rupture. The sooner a patient is operated upon, the better the prognosis. The child is first extracted, if it has not passed into the abdominal cavity. The methods are forceps (*not* version, as this will increase the extent of the tear), or craniotomy. If the child is in the abdominal cavity, it is removed by abdominal section.

Incomplete ruptures are best treated by daily packing with iodoform or sterile gauze. Great gentleness is necessary in the examination to determine whether a tear is complete or incomplete, as it is easy to tear through the peritoneum.

Complete ruptures are treated by abdominal section with removal of child and placenta, and hysterectomy below the site of the tear, with extraperitoneal fixation and drainage of the stump of the cervix (marsupialization). It may be possible to sew up the rent, and leave the uterus in situ, but this is rare. The edges are so ragged and the danger of leakage so great, especially at the angle, that the attempt is rarely justifiable.

If a patient should have a rupture of the uterus, and recover spontaneously, or if the rent has been sewed up and the uterus left in situ, she should be delivered by cesarean section in any future pregnancy, before she falls in labor, as a second rupture is almost sure to occur.

LACERATIONS OF THE CERVIX

Frequency.—Some injury occurs in every labor, but healing in moderate cases is usually spontaneous. Of every hundred

patients who suffer a torn perineum, about thirty-three will have a cervical tear sufficient to require repair.

Predisposing Causes.—(1) Elderly primiparæ; (2) rigidity; (3) scar tissue due to previous repair; (4) premature rupture of the membranes; (5) forceps before the os is sufficiently

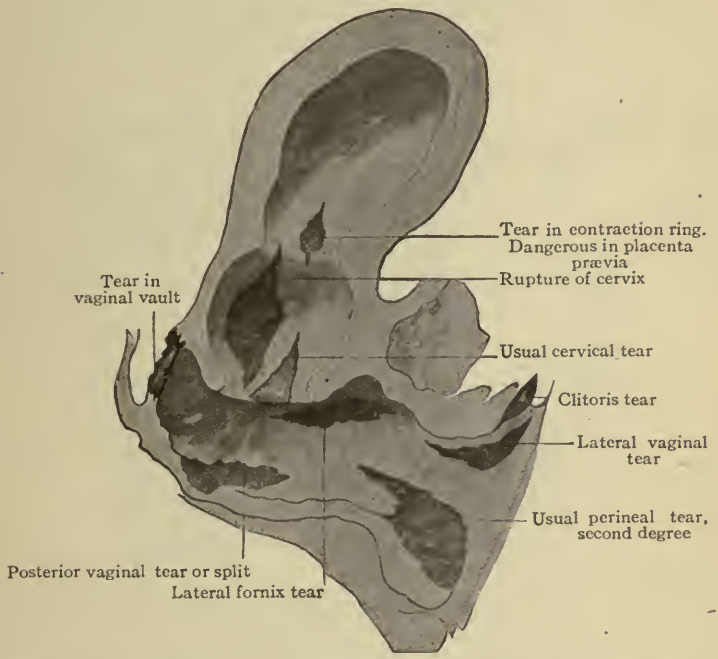

Tear in contraction ring. Dangerous in placenta prævia
Rupture of cervix
Tear in vaginal vault
Usual cervical tear
Clitoris tear
Lateral vaginal tear
Usual perineal tear, second degree
Posterior vaginal tear or split
Lateral fornix tear

FIG. 119.—Diagram of most frequent tears in the parturient canal. (*De Lee.*)

dilated; (6) precipitate delivery; (7) pituitrin given before dilatation is complete; (8) manual or instrumental dilatation.

Site.—The commonest tear is unequally bilateral; *next* unilateral, (3) stellate and (4) rarely annular detachment, where the entire cervix tears off.

Symptoms and Diagnosis.—Hemorrhage after delivery with a firmly contracted uterus usually means a torn cervix.

The cervix may be examined through a bivalve speculum or pulled down to the vulvar orifice with tenacula.

A satisfactory model of bivalve speculum is the Collin. It is simple and has only one screw to adjust. It is sterilized by boiling.

Method of Insertion of Speculum.—The patient is arranged across the bed, her feet on two chairs and her hips over the edge of the bed. The vulva is carefully cleansed with cotton and lysol solution (one dram to two pints). The physician

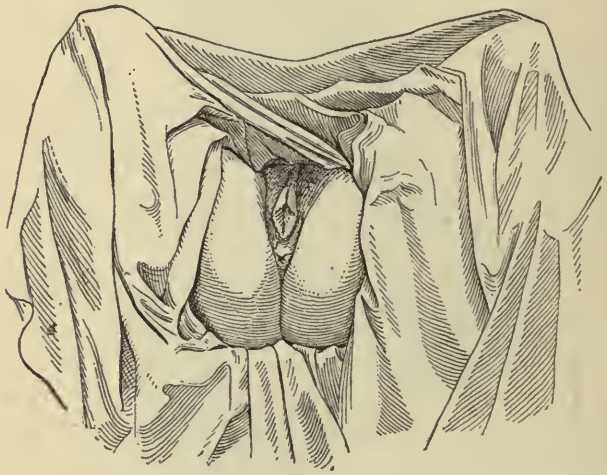


FIG. 120.—Patient draped for vaginal examination in the dorsal or lithotomy position. (*After B. C. Hirst.*)

determines the position of the cervix by examination with one finger. The speculum, oiled, is inserted edgewise, turned transversely and pushed in the vagina in the direction determined by the examining finger. This is usually downward at an angle of about 45 degrees, toward the bed or table on which the patient is lying. The blades are then separated, and if the direction of insertion is correct, the cervix should appear between the blades. If only the anterior vaginal wall is seen, the blades are allowed to collapse, the speculum is

half withdrawn, and re-inserted at a steeper angle. All motions should be gentle, and of course rubber gloves are worn.

When the speculum is correctly placed, the extent of the cervical tear can be seen.

To remove the speculum, it is withdrawn open for about an inch (so that the cervix will not be pinched) the blades are allowed to collapse, and the speculum is withdrawn, turning it edgewise again.

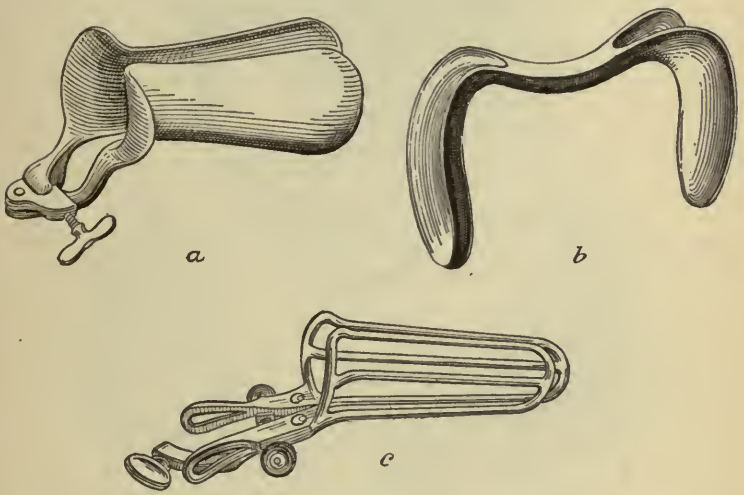


FIG. 121.—*a*, Collin's bivalve speculum. *b*, Sims speculum. *c*, Wire bivalve speculum, for exposure of the cervix and vaginal walls.

Time of repair may be immediate or delayed. The immediate repair has certain disadvantages. (1) The cervix is swollen and edematous and the stitches are likely not to hold; (2) the risk of sepsis is increased; (3) the difficulty of the operation is considerably more than when done a week later; (4) spontaneous healing will often occur, if the cervix is left undisturbed.

Consequences of Nonrepair.—(1) The bloody lochia are prolonged and more profuse; (2) subinvolution is more com-

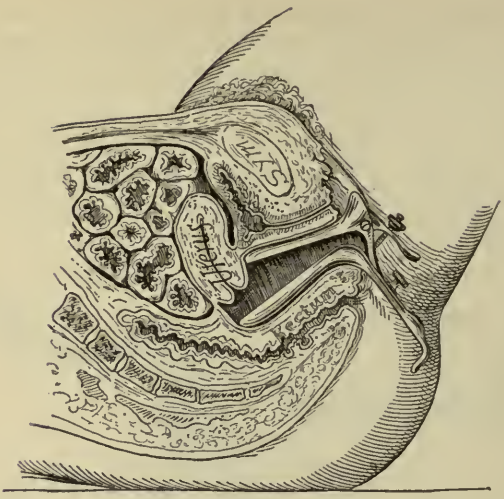


FIG. 122.—Bivalve speculum in position with blades open. The cervix appears between the blades.

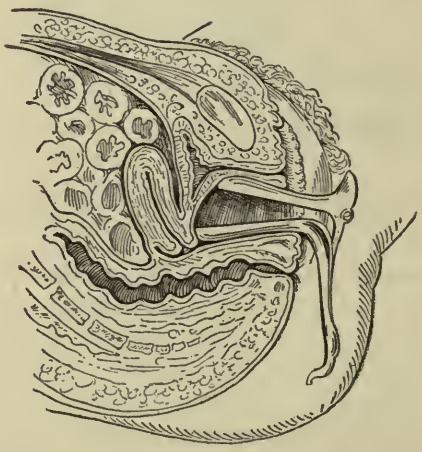


FIG. 123.—The commonest mistake in the use of a bivalve speculum. The instrument has been inserted at too slight an angle, and nothing except the anterior vaginal vault appears between the blades.

mon; (3) retroversion (due to the weight of the subinvoluted uterus) is more common; (4) leukorrhea; (5) erosion of the cervix.

Advantages of the Delayed Repair.—The diagnosis of extent of the tear is certain, sepsis is not to be feared, better approximation of the edges can be obtained and good results are more certain. The operation is done one week after delivery, provided there is no fever. If the temperature is

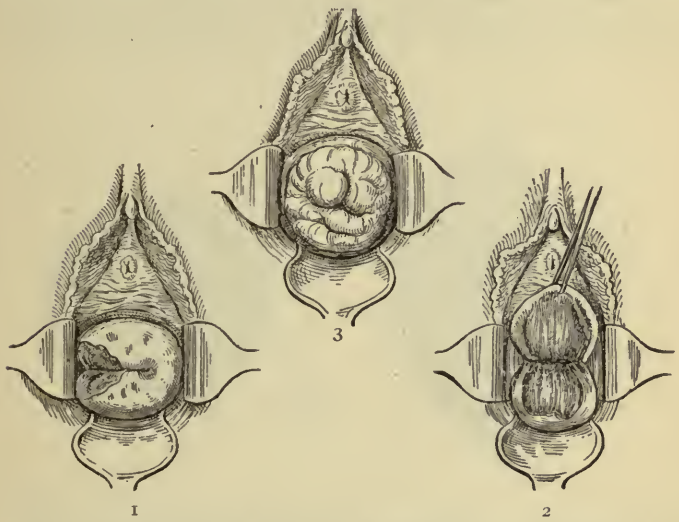


FIG. 124.—1. Unilateral laceration of the cervix. 2. Bilateral laceration of the cervix. 3. Stellate laceration of the cervix. As seen through a speculum.

elevated above 99.5° F. repair is postponed until it has been steadily normal for a week.

Technic.—(1) The patient is anesthetized and prepared as for any vaginal operation.

(2) The anterior and posterior lips of the cervix are caught with tenacula, pulled down and separated.

(3) The edges of the denudation are marked out, as in the Emmet trachelorrhaphy, care being taken to limit the denuda-

tion to the area of the laceration and not to encroach upon the cervical canal. The shape of the denudation is triangular, on each lip.

(4) Interrupted stitches, of number 3 forty-day chromic catgut are placed beginning on the mucous membrane of the vaginal aspect of the anterior lip, emerging close to the mucous membrane of the cervical canal, entering again close to edge of the mucous membrane of the canal on the posterior lip, and emerging on the vaginal aspect of the posterior lip, opposite the point of entrance on the anterior lip. Three or four sutures to a side are required.

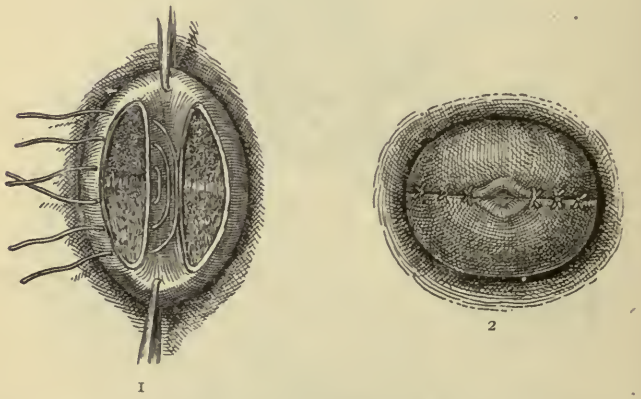


FIG. 125.—1. The method of denudation and placing the stitches for Emmet's trachelorrhaphy. 2. The repair completed.

(5) The stitches are tied, after all are inserted.

(6) When all are tied the cervical canal should have a caliber of the forefinger. Too tight closure will mean dysmenorrhea later. If the tear is unilateral, only one side is repaired; if stellate, each line of tear is repaired separately. Annular detachment requires no treatment, other than the removal of any irregular tabs of cervical tissue that may remain.

Catgut (forty-day chromic number 3) is preferable to silkworm-gut, as it does not have to be removed.

LACERATIONS OF THE ANTERIOR VAGINAL WALL

Clean cuts of the mucous membrane have no consequences, except hemorrhage directly after labor. If the bleeding warrants it, they are closed at once by a continuous stitch. If not, they heal spontaneously, if kept clean.

Muscle of the Urogenital Trigonum.—This is the analogous muscle to the compressor urethræ in the male. It arises at the junction of the symphysis and descending ramus of the pubis, and runs diagonally back above the anterior vaginal wall. It divides and joins its fellow from the opposite side above and

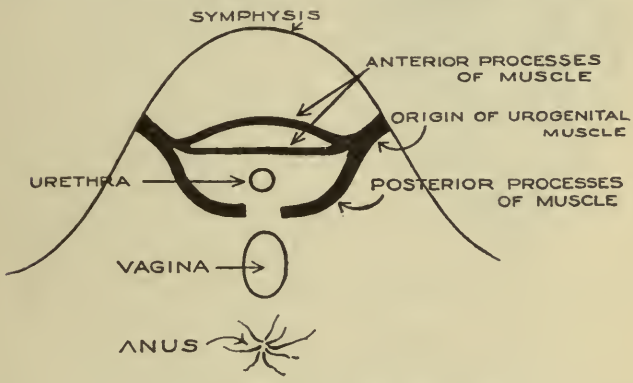


FIG. 126.—Anatomy of urogenital muscle.

below the urethra, inserting into the fascia of the anterior vaginal wall. It is the only direct muscular support possessed by the lower third of the anterior vaginal wall, to which it is a levator, and is a compressor urethræ. A tear of this muscle is one of the factors in the production of a cystocele, and also accounts for many cases of incontinence of urine after delivery.

Diagnosis of Injury.—With the patient in the dorsal position, the forefinger of one hand is inserted in the vagina, and pressure made straight up, to either side of the urethra, against the lower edge of the pubic bone. If the muscle is torn, the finger presses against the sharp edge of the bone. If it is not torn, a flat ribbon of muscular tissue and fascia is felt between the

finger and the bone. On inspection, the lower portion of the anterior vaginal wall bulges downward, if the muscle is torn.

Repair.—Like all other repairs, this is best done on the seventh day after delivery. Fever delays this until the temperature has been normal for a week.

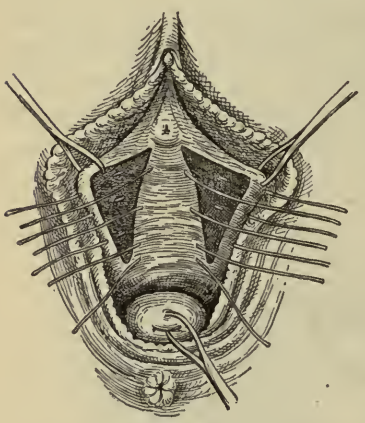


FIG. 127.—Repair of the muscle and fascia of the urogenital trigonum.

Technic.—(1) Dorsal posture, usual preparation and anesthesia.

(2) The anterior vaginal wall is caught by a double tenaculum, just to the outer side of the urethra.

(3) A second tenaculum catches the labium on the same side, at the same level.

(4) When these are separated, a triangular sulcus is seen on the lateral aspect of the anterior vaginal wall, with the point toward the cervix.

(5) This sulcus is denuded and the muscle repaired with a continuous tier stitch of number 1 forty-day chromic catgut.

Interrupted suture can be used, but continuous is quicker and better.

TEARS OF THE POSTERIOR VAGINAL WALL AND PERINEUM

The great majority of patients have some degree of perineal tear. The degrees of tear are variously classified, the more common division being: (1) First degree tears, involving only the tissues of the perineal body in the middle line; (2) second degree tears, involving the levator ani; (3) third degree tears, involving the sphincter ani.

Lacerations of the vulva and labia are really only abrasions. They are rarely deep, and unless attended by bleeding, do not require sutures.

Tears of the Vagina, Pelvic Floor and Perineum.—The structures injured are: (1) Levator ani (the main muscular support of the pelvic floor); (2) deep transversus perinei—torn in the middle line, and retracting to either side; (3) the fascia anterior and posterior to the deep transversus perinei—the anterior and posterior layers of the triangular ligament; (4) the superficial transversus perinei; (5) the bulbocavernosus; (6) the sphincter ani, if the tear extends that far in the middle line; (7) Colles' fascia, extending in from the fascia lata of the thigh.

Tears of the levator ani are two kinds: (1) Forceps cuts, which may be anywhere in the course of the muscle and are usually a more or less complete division at right angles to the fibers and (2) spontaneous tears, in which the muscle tears loose from its tendinous attachment to the descending ramus of the pubes, and tears obliquely downward across the fibers of the muscle, but not through them, so that the tear opens out as a book is opened. This muscle is the main support of the pelvic floor, and its injuries are attended by the well known effects of such a tear: sense of loss of support, rectocele, and later prolapse of the uterus.

The tear may be either open or submucous; the open tears are easy to see and feel, the submucous tears are often overlooked and result later in the misnamed "relaxation of the pelvic floor."

Causes of Perineal Tears.—(1) Spontaneous delivery. (2) Forceps (almost invariably cause a tear). (3) Hurried delivery. (4) Posterior shoulder of child will often make or extend a laceration. (5) Contracted pelvis—the narrow pubic arch forcing the head posteriorly. (6) Occipitoposterior positions. (7) Edema from prolonged labor. (8) Rigidity.

In patients who have been properly repaired, it is common for the perineal body to give way, in subsequent labors, but injuries of the levator are much less common than in primiparæ.

Diagnosis of laceration of the perineum is best made four or five days after delivery. It is impossible correctly to diag-

nose the full extent of injury to the pelvic floor directly after labor.

Tests.—The patient is placed across the bed, in the dorsal position (2) She is asked to strain, when the degree of gaping of the labia is noted. (3) After careful cleansing of the vulva, the labia are separated, when any obvious tear can be seen. (4) The thickness of the perineal body is palpated by one gloved finger in the vagina and the thumb outside, on the

FIG. 128.—Proper way to arrange a patient across the bed for vaginal examination. There is plenty of room, and the chairs are out of the way.

perineum. This will disclose injury to the bulbocavernosus, superficial and deep transversus perinei muscles. (5) The levator ani is tested as follows: The forefinger is inserted in the vagina, up to the second joint, and pressed downward and outward, to note a cleft, if any, in the muscle. The forefinger is swept from one pubic ramus to the other, to note whether the muscle forms an unbroken horseshoe curve. With the forefinger in the vagina and the thumb outside, the thickness

of the levator is palpated. (6) The sphincter ani is always tested last, by feeling the complete circumference of the muscle with the forefinger in the rectum and the thumb outside. It is easy to overlook a submucous tear of the sphincter, and a serious mistake to do so. Mere inspection of the perineum is no guide to the extent of injury present.

Central Tear of the Perineum.—In very rigid perinei, when overdistended by the head, a circular perforation some-

FIG. 129.—Wrong way to arrange a patient across the bed for vaginal examination. The chairs are so close together that there is no room for examination.

times appears midway between the posterior commissure of the vulva and the anus. This should be at once opened through into the vagina by scissors, followed by a double episiotomy. Unless so treated, the head is likely to emerge from the rectum, with disastrous results to the sphincter.

Symptoms of Tear Through the Sphincter Ani (Complete Tear).—(1) Incontinence of gas and feces (which may mean only overstretching of the sphincter); (2) the sphincter forms

a slightly curved line across the posterior border of the anus; (3) its ends are marked by two visible dimples or pits; (4) the folds of skin, or rugæ, normally surrounding the anus are gone anteriorly and deepened posteriorly; (5) if the sphincter be palpated with one finger in the rectum, the gap in the ring muscle can be felt plainly.

Time of Repair.—The immediate repair of the perineum is not advised, for the following reasons: (1) Accuracy of

FIG. 130.—Testing the levator ani muscle. The forefinger is inserted in the vagina up to the second joint; the thumb is midway between the tuberosity of the ischium and the anus.

diagnosis is impossible; (2) the bruised and edematous tissues are not good material for repair; (3) the danger of infection is very much greater; (4) these repairs are often only the closure of the perineal skin, with entire disregard of the muscular injuries; (5) failure is common, necessitating a second operation later. Above all does this apply to operations for complete tear of the sphincter ani.

All these disadvantages can be obviated by repair on the

seventh day after delivery, unless the patient has fever, in which case the repair is postponed until the temperature has been normal for a week. With ordinary care, sepsis is not to be feared, and objections based upon supposed difficulty or unfavorable healing are not based upon fact.

Treatment

Preventive.—Avoidance of undue haste in delivery; protection of the perineum by retarding the head; lack of haste

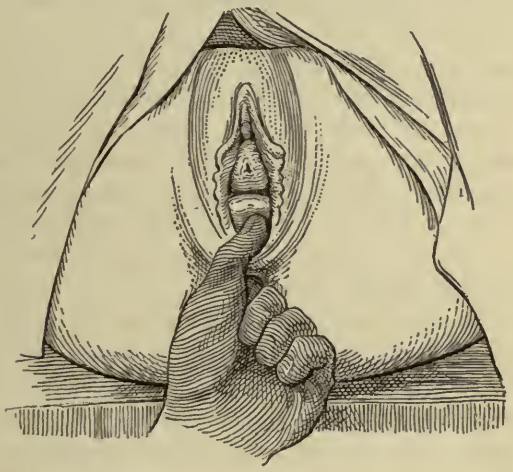


Fig. 131.—Testing the sphincter ani for laceration. (*After B. C. Hirst.*)

in forceps delivery; using small forceps (Hale-Sawyer) wherever possible; episiotomy when indicated; avoidance of large doses or indiscriminate use of pituitrin. By observance of these details, many, but by no means all, lacerations can be avoided or at least limited in extent.

Technic of Repair.—*Immediate.*—No matter what the physicians preference may be, this should never be undertaken if the vulva and vagina are badly bruised; if there is reason to believe that there is beginning infection; if the patient is excessively exhausted or if she is an eclamptic; or if the

laceration dates from a previous labor. It is not advisable to place the sutures before the placenta is delivered, and the old practice, recently revived, of putting sutures in the perineum before delivery of the head, and removing them, if not needed, after delivery is illogical. Anesthesia is said not to be needed, because the overstretched tissues are not sensitive. The patient's actions, while the repair is in progress, will cause the physician some doubts as to the accuracy of this statement.

Technic of Immediate Repair.—(1) The patient is arranged across the bed, with her feet on two chairs, and her hips over the edge of the bed.

(2) The vulva is carefully cleansed with cotton and lysol solution (one dram to two pints).

(3) If much blood is trickling down from above, a large gauze sponge may be inserted in the vagina, against the cervix, and *removed after the stitches are in place, but before they are tied.*

(4) The labia are separated and the extent of the injury inspected. This is materially aided by retraction of the anterior vaginal wall by an assistant.

(5) Visible open tears of the levator may be sutured with a continuous number 1 chromicized catgut stitch.

(6) The perineal body is repaired by interrupted stitches of number 3 chromic catgut or silkworm-gut, placed so that the entire depth of the tear is included, and not the skin of the perineum only.

Episiotomy wounds are sutured in the same way. Plain catgut is not to be used, as it disappears too soon. Silk and linen thread have the disadvantage of cutting through the tissues. The after-care of these repairs is as described under the delayed repair of the perineum. The silkworm-gut sutures are removed on the twelfth day. The catgut ones will disappear spontaneously. The sphincter ani may be repaired immediately, if torn, but much better results are attained by delaying the repair for at least a week. If the repair is undertaken at once, it is done as described in the delayed repair.

Technic of the Delayed Repair of the Perineum. Preparation

for Operation. Day before Operation.—4 P. M. Shave pubes completely. 9 P. M. Magnesium sulphate ½ ounce, or citrate of magnesia, flat, 8 ounces.

Day of Operation.—Early in morning, cup of beef tea, no other breakfast. Clear lower bowel out thoroughly by repeated enemas, so that last enema is given at least two hours before operation. Continue enemas until water returns clear. Two hours before operation give paregoric 1½ teaspoonful.

Catheterize just before etherization.

Do not give any hypodermic of morphin and atropin. The paregoric takes its place.

Local preparation done on the table.

The technic of the Emmet, Hegar, and B. C. Hirst operations is as follows:

Emmet Operation.—(1) The patient is in the dorsal position, the vagina carefully cleansed with tincture of green soap, hot water and lysol solution.

(2) As nearly all local discharge contains pathogenic organisms, the uterus should be washed out with lysol solution, and a large pledget of cotton soaked in lysol solution placed against the cervix. This must always be removed as soon as the operation is completed.

(3) Each labium is caught with a bullet forceps just below the lowest myrtiform caruncle (above which is the duct of Bartholin's gland) or more conveniently the labia are separated with the Gelpi self-retaining perineal retractor.

(4) The tip of the rectocele is caught with a volsellum (the tip is the portion nearest the cervix, in the midline, which *without tension* can be brought down to the posterior commissure of the vulva).

(5) The lateral sulci are denuded in one piece or in strips.

(6) The central perineal triangle is denuded, and if any granulation tissue is present, it is curetted off with the edge of a knife.

(7) The lateral sulcus wounds are closed by continuous or interrupted sutures of number 1 chromic catgut, or interrupted

sutures of silkworm-gut. Catgut stitches are tied, silkworm-gut are secured with perforated shot, as it makes their removal easier.

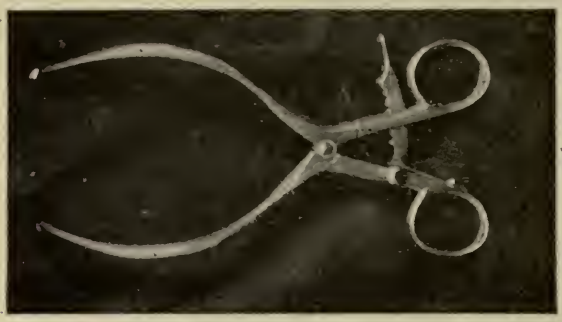


FIG. 132.—The Gelpi self-retaining perineal retractor, for use in plastic operations. It is especially useful where one has only one assistant.

(8) The crown stitches of number 1 chromic catgut or silkworm-gut are inserted. The stitch passes through one labium,

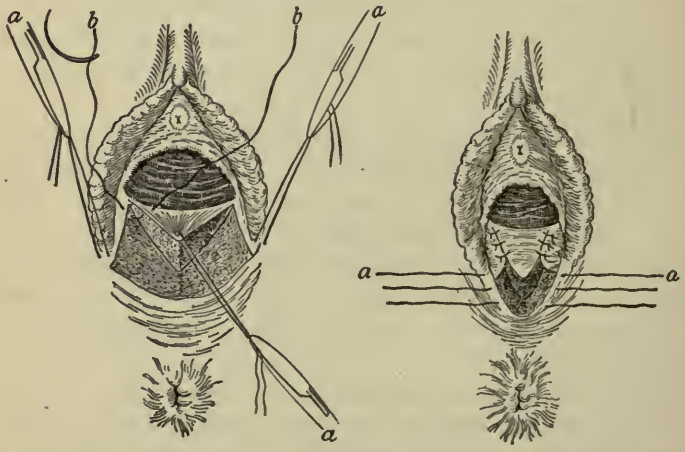


FIG. 133.—The Emmet perineorrhaphy. (*After Stewart.*)

just below the tenaculum, emerges in the sulcus just below the last sulcus stitch, transfixes the tip of the rectocele, and passes

through the other labium to emerge on the skin perineum, just opposite its point of insertion. Two or three of these stitches are required.

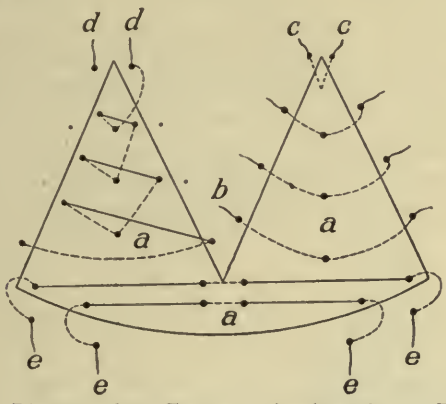


FIG. 134.—Diagram of the Emmet perineal repair. *a*, Denuded area; *b*, area not denuded; *c*, interrupted stitches in sulcus; *d*, continuous stitches in sulcus; *e*, crown stitches.

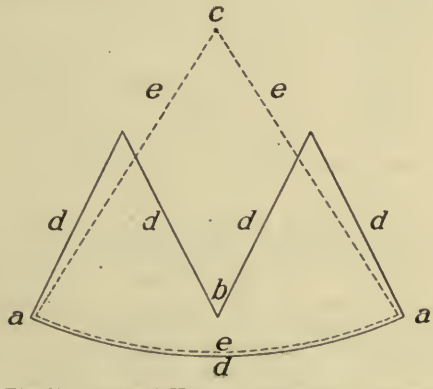


FIG. 135.—The Emmet and Hegar denudations compared. *a*, Lowest myrtiform caruncle, the same in both operations; *b*, tip of rectocele; *c*, highest point in Hegar operation on posterior vaginal wall; *d*, lines of Emmet denudation; *e*, lines of Hegar denudation. The solid lines show the shape of the Emmet denudation; the dotted lines that of the Hegar.

The Emmet operation is not always a satisfactory one, as it takes no account of the anatomic lines of laceration,

but answers very well if the laceration is of moderate extent.

Hegar Operation.—(1) The patient is prepared as for the Emmet operation.

(2) The labia are caught, as in the Emmet operation.

(3) A point in the middle of the posterior vaginal wall, about two-thirds of the way from the vulva to cervix, is caught with a volsellum.

(4) The large single triangle formed by these three instruments is denuded, care being taken to avoid wounding the

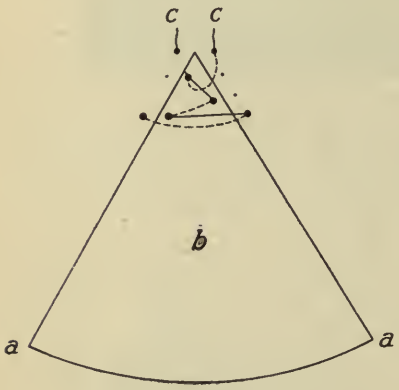


FIG. 136.

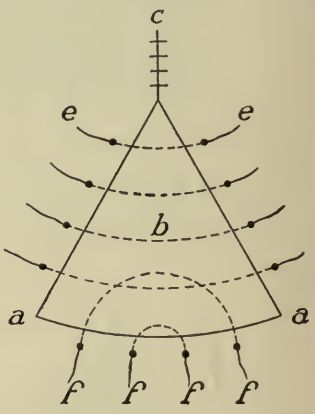


FIG. 137.

FIG. 136.—Denudation in the Hegar operation, and suture of the rectocele above the levator ani. *a*, Myrtiform caruncles; *b*, denuded area; everything included in triangle is denuded; *c*, stitch puckering up tip of triangle.

FIG. 137.—Hegar operation, second stage. *a*, Myrtiform caruncles; *b*, denuded area; *c*, puckered up tip of triangle; *e*, interrupted stitches of levator ani; *f*, interrupted suture of perineal body.

rectum, an accident likely to occur unless great care is exercised. Any granulation tissue in the area to be denuded is curetted off.

(5) Transverse interrupted stitches are placed across this triangle from the apex downward. The upper ones may be of number 3 chromic catgut, the lower three vaginal and the peri-

neal stitches should be silkworm-gut, because they are under considerable tension.

(6) The perineal stitches are placed, beginning with the one nearest the anus, so as to close the wound in the perineal body, entering from and emerging in the perineal skin.

The Hegar operation regards the normal perineal anatomy and its injuries still less than the Emmet operation, but is usually satisfactory in its end results, especially in old lacerations, dating from a previous labor, with a large rectocele.

Technic of the B. C. Hirst Perineorrhaphy.—(1) The patient is prepared as for the Emmet operation.

(2) The labia and tip of the rectocele are caught as in the Emmet operation.

(3) The sulci and central triangles are denuded as in the Emmet operation.

(4) The fascia covering the levator ani is incised, on each side, in a line parallel to and just beneath the edge of the sulcus denudation, and the actual tear in the muscle exposed. The tear in the levator ani is closed on each side, inside the sheath of the muscle, by a continuous stitch of number 1 chromic catgut.

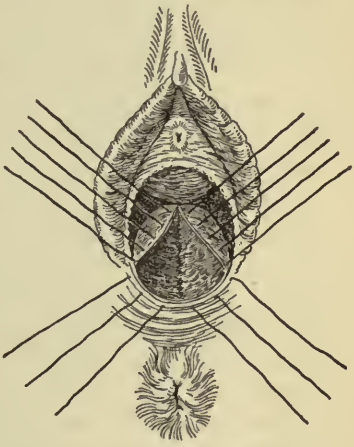


FIG. 138.—The Hegar perineorrhaphy.

(5) Two interrupted stitches are placed through the sheath and end of the deep transversus perinei muscle, but are not tied. The stitches pass through the sheath and muscle of one side, pick up the perineal body floor in the middle line, between the anterior and posterior layers of the triangular ligament, and through the sheath and muscle of the opposite side.

(6) The posterior layer of the triangular ligament is closed

over the bulging rectum, it being through the tear in this ligament that the rectocele protrudes.

(7) The lateral sulci are closed as in the Emmet operation, by a continuous stitch.

(8) The tip of the rectocele is fastened down to the posterior column of the vagina, inside the posterior commissure of the vulva, where it originally belongs.

(9) The tension of the Gelpi retractor is relaxed, and the two stitches securing the deep transversus perinei are tied.

(10) The tears of Colles' fascia, bulbocavernosus, superficial transverse perinei and anterior layer of the triangular ligament, all in the perineal body, are closed by interrupted stitches placed so that, when tied, the knots will be covered in when the perineal skin is closed.

(11) The perineal skin is closed.

All catgut used is number 1 chromic catgut, of forty-day durability, except in the skin sutures, where overchromicized number 1 gut is used. This operation is designed to correct the lacerations in the planes in which they occur, and to effect a normal anatomical restoration.

No perineal operation should be attempted from a written description. For its understanding, actual demonstrations are necessary. It is not usually advisable to put in any vaginal packing, as it tends to dam back the lochia.

Routine After-care of Plastics.—1. Morphin sulph. gr $\frac{1}{6}$, atropin sulph. gr. $\frac{1}{150}$, 6th hour p.r.n. 2. Water p.r.n. first twenty-four hours. 3. Irrigate perineal stitches with sterile water four times daily, and also after each urination or bowel movement, and keep sterile vulvar pad in place after irrigation. Inspect stitches frequently. 4. If stitches become soiled, clean with cotton on applicator and peroxide of hydrogen. Moderate cutting may be disregarded. 5. Vaginal douche sterile water every day after fifth day. 6. Simple enema once or twice in second twenty-four hours. 7. End forty-eight hours, calomel gr. $\frac{1}{6}$ every hour for six doses. Six hours later magnesium sulphate one-half ounce.

8. Soft diet after first twelve hours, light diet fifth day, full diet seventh day. 9. Catheterize eighth hour p.r.n. 10. Take out vaginal packing in twenty-four hours, if any inserted, *and note its removal on the chart.* 11. As a routine laxative use compound cathartic pills, one at bed time. If too active, give only half a pill. If griping, use A.B.S. and C. pill.

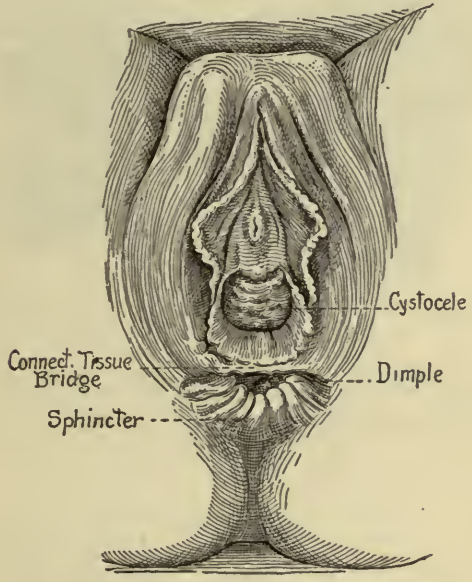


FIG. 139.—A typical complete tear of the perineum through the sphincter ani. (*After Graves.*)

Operation for Complete Tear.—Repair of a complete tear should never be attempted as long as there is any edema, sloughing, unhealthy granulation, or fever. Failure is sure if this precaution is disregarded. If a complete, or any other perineal tear shows sloughing or edema, restoration to healthy condition is more quickly attained by thrice daily douches of sterile water, and application of weak solutions of nitrate of silver (gr. x to oz. j.) to any place showing persistent false membrane.

Preparation for repair of complete tear is the same as any plastic operation, except that several days must be devoted to getting the bowels to move freely, before the operation is attempted.

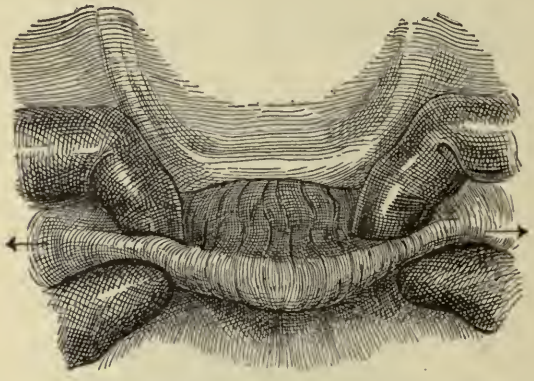


FIG. 140.—Arrows indicate direction of traction. Stretching the sphincter ani in a complete tear operation.

Technic.—(1) The patient is arranged and cleansed as for any plastic operation.

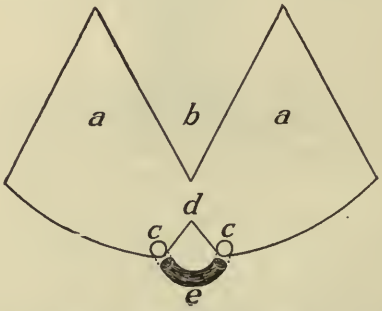


FIG. 141.—Diagram for complete tear operation. *a*, Lateral sulci in vagina (denuded); *b*, rectocele (not denuded); *c*, sphincter pits; the empty ends of the sphincter sheath; *d*, tip of tear in rectovaginal septum; *e*, sphincter ani, retracted in its sheath.

(2) The sphincter is stretched by grasping between the thumbs and forefingers, and stretched for a full minute.

(3) The labia and tip of rectocele are caught as in the Emmet operation.

(4) An incision is made from one sphincter pit, around the tear in the rectovaginal septum, to the other sphincter pit.

(5) The rectovaginal septum is split, between the vagina and rectum, so as to secure an ample margin of raw tissue, without sacrifice of any unnecessary portion.

(6) The tear in the rectovaginal septum is repaired by interrupted silkworm-gut stitches, put in from the rectal side, so that the knots, when tied, will be in the rectum. Inter-

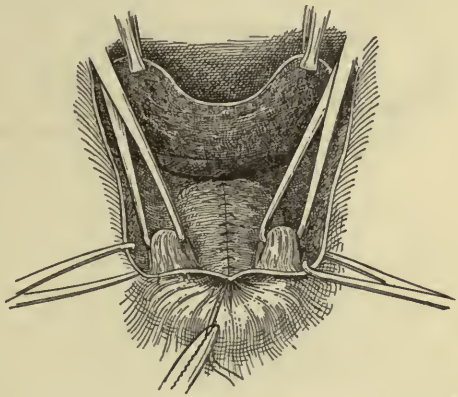


FIG. 142.—Bringing up the ends of the sphincter ani. The ends of the muscle are retracted in the sheath, ¼ to ½ inch below the surface of the denudation. (*After Crossen.*)

rupted chromic catgut stitches with the knots buried in the perineal body may be used, but with a greater likelihood of rectoperineal fistula.

(7) The ends of the sphincter are pulled out of the pits into which they had retracted, by single tenacula, and cleared of any granulation tissue which may cover them.

Two interrupted stitches of number 1 chromic catgut are passed through the ends of the muscle, so that when tied the knots will be buried in the perineal body. These are for approximation *only*. Two silkworm-gut stitches are passed

through the sphincter and sheath, beginning at the mucocutaneous junction at the anus on one side, and emerging at a corresponding point on the opposite side. These are for approximation and tension. With this plan, further tension stitches are unnecessary.

(8) All the rectal stitches are tied from above downward.

(9) The rest of the perineal injury is repaired as may be required by the extent of the tear, disregarding the rectal feature of the tear. In complete tears it is most common for the levator to escape injury, and the tear is confined to the perineal body in the middle line.

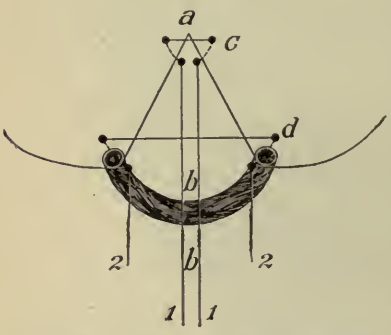


FIG. 143.—The stitches of the complete tear operation. *a*, The tip of the tear in the rectovaginal septum; *b*, the sphincter ani; *c*, denuded area around the tear in the rectovaginal septum; *d*, end of sphincter, dug out of its pit. 1. Interrupted suture closing apex of tear in rectovaginal septum. 2. Interrupted suture, through sphincter and sheath. Only one of each kind is shown.

After-treatment is the same as any plastic except for the care of the bowels. Much the safest plan is to keep the bowels liquid from the start, usually either magnesium citrate, flat, or Rochelle salts. Either of these is used in quantities varying in each case, but sufficient to give two liquid movements a day. This plan is much safer than keeping the bowels locked, and infection is not to be feared. The stitches are removed on the sixteenth day, best in the knee-chest posture through a rectal speculum, cautiously opened, and the bowels must be kept liquid for at least a month and soft for two or three months thereafter. The commonest cause of failure, next to infection, is neglect of the bowels, especially after the stitches have been removed. Infection is likely to result in either complete failure or rectovaginal or rectoperineal fistulæ. These latter rarely if ever heal spontaneously, and must be closed by a second operation.

In this or any other plastic it is unnecessary to keep the knees bound together, unless the patient is unruly or delirious, and she may turn on either side after forty-eight hours.

Factors Essential to Success in Complete Tear Operations.—(1) Choice of proper time and condition for operations. (2) Stretching of sphincter. (3) Exposure and cleansing of ends of sphincter. (4) Permanent suture material (silkworm-gut). (5) Pass sutures deep enough to catch sheath of sphincter. (6) Leave stitches in at least sixteen days. (7) Keep bowels liquid from start. If the bowels should be locked, the

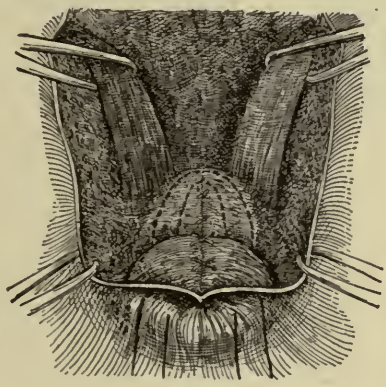


FIG. 144.—The sphincter repaired. (*After Crossen.*)

first movement must be secured under oil enemata, and in all probability by breaking up the fecal mass by the gloved finger, inserted in the anus and morcellating the mass by pushing back toward the sacrum and *never* forward.

With proper management, and if necessary, timely episiotomy, a repaired sphincter will usually withstand subsequent delivery without giving way.

Genital fistulæ, being as a rule, late complications, are best considered in the next chapter, in the pathologic sequelæ of childbirth.

CHAPTER XIV

THE PATHOLOGIC SEQUELÆ OF CHILD-BIRTH

The commoner pathologic sequelæ of child-birth, injuriously affecting the patient's health are:

(1) Lacerations of the birth-canal. (2) Erosion of the cervix (not due to laceration). (3) Retrodisplacement of the uterus. (4) Pelvic inflammation. (5) Diastasis of the recti. (6) Floating kidney. (7) Fractured coccyx. (8) Rectocele. (9) Cystocele. (10) Prolapse of the uterus. (11) Incontinence of urine. (12) Genital fistulæ.

Many of the operations required in the treatment of the pathological sequelæ of child-birth are here described by principle only and not by detailed steps of technic. They are all done at periods remote from delivery, and hence are properly included in works on gynecology, and have no direct bearing on the obstetric question. This applies especially to the operative treatment of backward displacement of the uterus.

Lacerations are described in the preceding chapter.

EROSION OF THE CERVIX

Erosion of the cervix is commonly miscalled ulcer. It is not ulceration, but a prolapse of the deep-red columnar epithelium of the cervical canal over the squamous epithelium of the anterior and posterior lips of the cervix. Its appearance is red and angry. It bleeds easily to the touch, but is not ulceration in the sense that destruction of tissue accompanies it. The causes are: (1) Laceration. (2) Gonorrhea. (3) Non-specific infection of the cervical or endometrial glands. It is occasionally seen in virgins, and in these cases often no cause can be found.

Symptoms.—The symptoms of erosion are a profuse, stringy mucopurulent leukorrhea.

Diagnosis is made by inspection through a bivalve speculum. It is not possible accurately to diagnose erosion by digital examination. The anterior or posterior lips of the cervix are the site of apparent ulceration, red, and bleed easily when touched with an instrument. When the blades of the bivalve speculum are widely opened, it is common for the lips of the normal cervix to be separated so that the mucous membrane of the cervical canal is visible. When the speculum is slightly withdrawn, the lips fall together and the apparent erosion disappears. When erosion really exists, it does not disappear when the speculum is withdrawn.

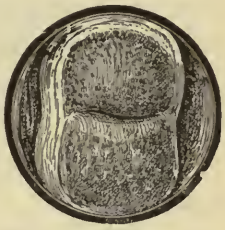


FIG. 145.—Bilateral laceration of the cervix, with marked eversion and erosion, as seen through a bivalve speculum. (*B. C. Hirst.*)

Treatment.—Erosion due to laceration of the cervix will not disappear permanently until the laceration is repaired. Erosion due to gonorrheal infection is incurable, as long as the disease persists. From both these causes, erosion is merely a symptom which disappears as soon as the primary cause is removed. The best routine treatment for erosion of the cervix, not due to one of the above causes, is to expose the cervix, through a bivalve speculum, pour in the speculum enough 40 gr. to the ounce nitrate of silver solution to cover the cervix completely, allow it to remain for five minutes, sponge out the excess and remove the speculum. If the solution causes unpleasant stinging, it can be neutralized by a douche of normal salt solution (one dram to the pint). This application, repeated once or twice, at intervals of forty-eight hours, is usually all that is required. If a vaginal douche is deemed advisable, the following will be found satisfactory: Carbolic acid 2 drams, zinc sulphate 1 ounce, dried alum 3 ounces. Two teaspoonfuls of this powder to two

quarts of hot water. The directions to the patient for taking a douche are:

1. Always in recumbent posture, preferably in bath tub.
2. Use fountain syringe and *never* a forced flow.
3. Boil syringe and nozzle, and use boiled water.
4. Use only mild antiseptics, such as boric acid; permanganate 1–3000, and *not* bichlorid or carbolic acid.
5. Have water comfortably hot. *Never* cold.
6. Have syringe not more than two feet above body.
7. Control flow, so that four quarts will take fifteen minutes to flow through.
8. Use nozzle with blind end, and openings in side.
9. Do not use hot douche just before, during, or just after period.

Sometimes a severe erosion will require amputation of the cervix. This is only to be done when all other means have failed. As little as possible of the cervix should be removed, because of the tendency to subsequent miscarriage. It is well to have all these persistent erosions examined microscopically for possible malignancy.

RETRODISPLACEMENT OF THE UTERUS

Retrodisplacement of the uterus is of two kinds:

Retroversion where the uterus is turned backward without distortion of its longitudinal axis; **retroflexion** where the uterus is sharply bent backward.

Symptoms.—(1) Persistent backache, low down, relieved by lying in bed, disappearing in the morning and gradually increasing all day. If the uterus is adherent, the backache may be constant; (2) persistent vertical or occipital headache; (3) moderate pain in both groins (torsion of the broad ligaments; (4) dysmenorrhea or menorrhagia, also irregularity, with a tendency to frequency of the periods. Many cases are attended by no symptoms at all, the retroversion being discovered in the course of examination for other complaints.

Diagnosis.—*The position of the cervix is no guide to the position of the uterus.* Two fingers of one hand are inserted in the vagina, the tips of the fingers being in the *anterior* vaginal vault. With counterpressure on the abdomen, the uterine body should be felt between the fingers. If it is not, the fingers in the vagina are placed behind the cervix, and the uterine body may be felt in the hollow of the sacrum. In cases of doubt the position of the uterus may be determined by a uterine sound, but the danger of injury and infection is so

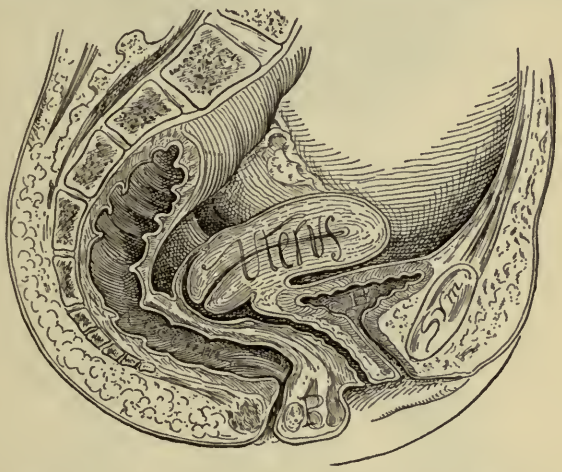


FIG. 146.—Normal position of the uterus. (*Ashton.*)

great that the method cannot be recommended. In all doubtful cases, an anesthetic may be necessary. A diagnosis should never be made unless the bladder is empty.

Treatment.—This depends upon: (1) The time when the patient is seen; (2) the presence or absence of adhesions; (3) the social class of the patient, as the palliative treatment with a pessary requires care and attention a working woman is not able to afford.

If the retroversion is discovered at the final examination, six weeks after child-birth, the uterus may be replaced and

kept in place by a pessary. This is the only time a pessary may effect a cure. The chance of success is about 50 per cent.

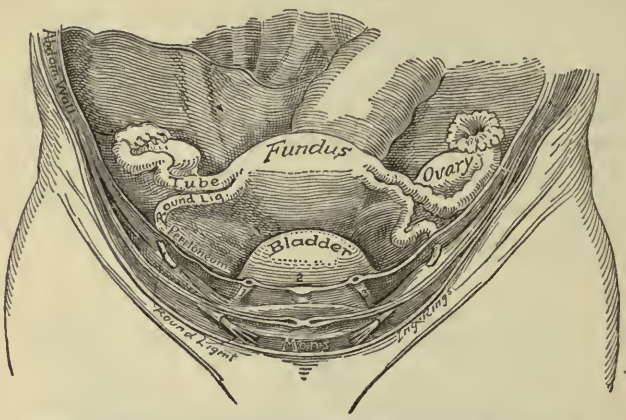


FIG. 147.—Normal position of the uterus, seen from above.

At all other times, the pessary is merely a crutch and will not cure.

FIG. 148.—Diagram illustrating the three degrees of retroversion of the uterus. The third degree is often called complete retroversion. (*After Skene.*)

Reposition of the Uterus.—The patient is arranged in the dorsal position. Two fingers of one hand are placed in the

vagina, the tips of the fingers behind the cervix. The uterine body is lifted up as far as possible, and the other hand, on the

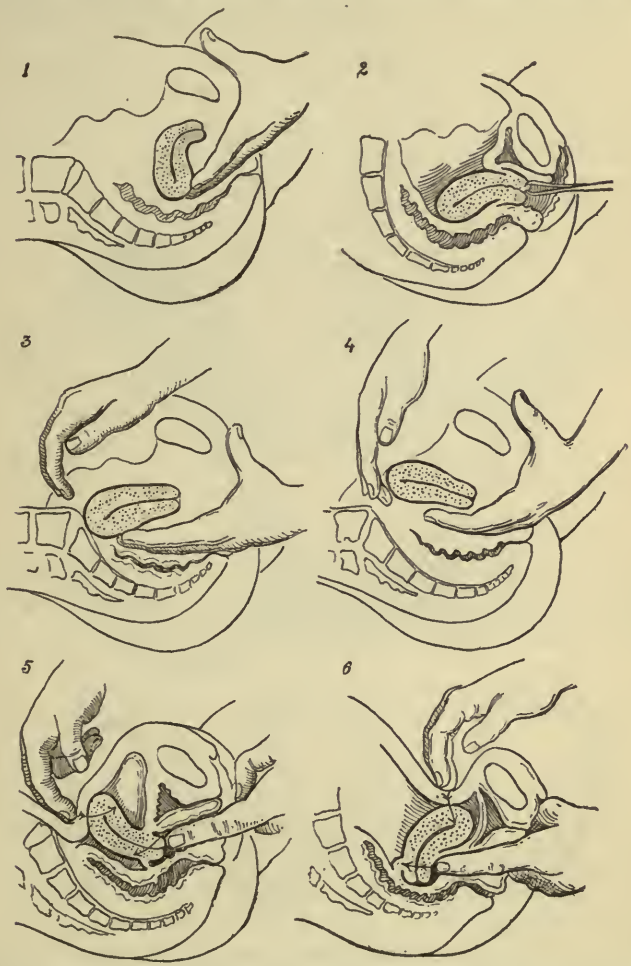


FIG. 149.—The different steps in bimanual reposition of a retroverted uterus. This is only possible when the patient is thin, relaxed, and the uterus is not adherent.

abdomen, attempts to hook the fingers behind the fundus

and pull it forward. This is only possible when a patient is thin, the abdomen relaxed, and the uterus free from adhesions. A double tenaculum, in the anterior cervical lip, is often use-

FIG. 150.—Knee-chest elevated position. (*Ashton.*)

ful. If this attempt fails, the patient is put in the knee-chest posture, the perineum retracted by a Sims speculum, and the uterus pried up by a repositor in the posterior vaginal vault,

Hodge Smith Thomas

FIG. 151.—The three types of retroversion pessary in common use.

aided by a tenaculum in the cervix. If this fails, the attempt should be repeated under an anesthetic. The reposition of the uterus by a sound or catheter in the uterine cavity is

efficient but dangerous, and should not be used unless proper aseptic precautions are observed. If the uterus can be replaced at all, one of the methods described will be successful.

Retention of the Uterus in Position.—If the uterus is free from adhesions; if there is good perineal support; if the uterus can be replaced, and if the patient does not have to do hard manual labor, a pessary will keep the organ in proper position.

Kinds of Pessary.—The kinds in most common use are: (1) Hodge; (2) Albert Smith modification of the Hodge, and

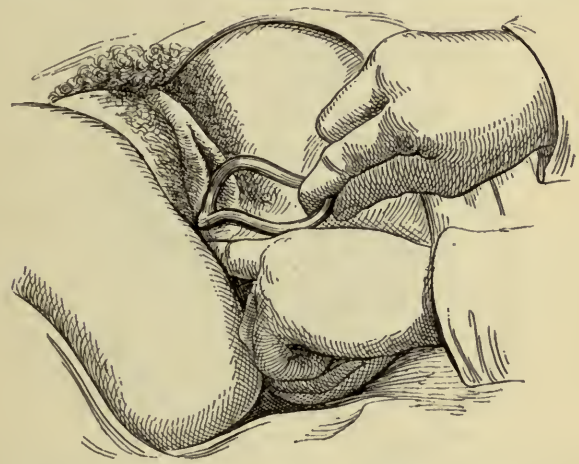


FIG. 152.—The first step in the insertion of a pessary. (*After B. C. Hirst.*)

(3) Thomas. The Smith and Thomas pessaries are the best, the Hodge is usually uncomfortable, except in cases where there is a moderate lack of perineal support.

Insertion of a Pessary.—(1) The patient is in the dorsal position; (2) the uterus is in proper position; (3) the pessary is grasped by the lower bar and greased (glycerin); (4) the forefinger of one hand presses down in one vaginal sulcus; (5) the pessary is inserted obliquely in this sulcus, and upside down, for about one-half its length; (6) the pessary is turned right side up; (7) the forefinger of the other hand makes

pressure on the *upper* bar of the pessary, carrying it up and behind the cervix (never in front of the cervix).

Qualifications for Proper Pessary.—(1) No portion of it is visible when inserted (if so, it is too long, and can be shortened by increasing the curvature); (2) it should reach from the posterior vaginal vault to the anterior vaginal wall, at the level of the internal urinary meatus; (3) there should be room to pass the finger all around it; (4) it should be the smallest that will satisfactorily support the uterus; (5) it should cause no pain;

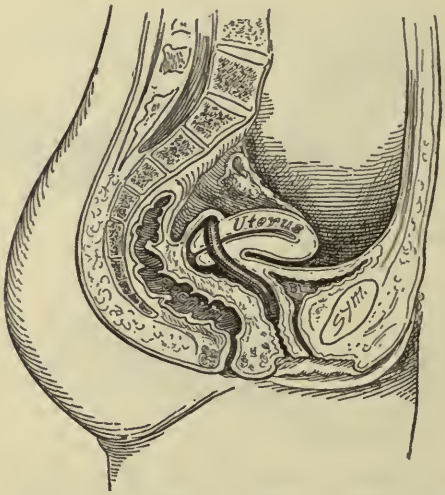


FIG. 153.—The pessary in position. (*After Skene.*)

(6) it does not interfere with coitus; (7) in cases of retroflexion the Thomas pessary is used to span the angle of flexion. It is not always possible to find at the first trial a pessary satisfactory in all respects. The instrument must be fitted to each case. The shape of the pessary can be varied by immersing in boiling water; moulding it to the desired shape, and then plunging in cold water to harden it.

After-treatment.—The patient is told to report in two weeks, or sooner if she is uncomfortable. She then reports every four

weeks for three months. At each visit, the pessary is removed by hooking the forefinger *from below*, under the lower bar; the vaginal vaults are inspected through a bivalve speculum for possible erosion or irritation, and if none is found, the pessary is reinserted. After three months, an attempt is made to do without the pessary, for two weeks; if the uterus is found in good position, and again four weeks later, the patient may be discharged as cured. If the displacement recurs, the pessary is again inserted for three months, with examination as before. If then, after the pessary has been worn for six months, the uterus will not stay in place without support, the patient is given her choice between the constant wearing of a pessary or operation. During the period of trial, the patient may undergo a course of pelvic massage and Swedish movements, designed to strengthen the pelvic muscles and ligaments, but of doubtful value.

The long-continued wearing of a pessary is not desirable. It requires constant watching, the pressure of it is irritating, it tends to aggravate any neurosis of the patient, and to convince the patient that she requires constant medical attention. Frequent vaginal douching while the pessary is worn is not advisable; a douche of salt solution twice a week is ample. A pessary is not indicated in a patient who has to work; it is contra-indicated in an adherent retroversion, in perineal lacerations and only the Thomas pessary should be used in cases of retroflexion.

Adherent retroversion may sometimes be managed by placing the patient in the knee-chest posture, retracting the perineum with a Sims speculum, and packing in the posterior vaginal vault small wool tampons, making as much pressure as the patient can endure. The vagina is then packed with other tampons to hold the upper ones in place. A strict count should be kept of the number inserted. They are removed in forty-eight hours, the vagina douched, and a fresh lot inserted. This treatment, kept up over six or eight weeks, will sometimes replace a uterus which at first was densely adherent. It is

uncomfortable and requires patience, but as a means of avoiding operation is worth a trial.

Operative Treatment of Retrodisplacement.—Many operations have been devised, but those in most common use are the following:

(1) The Alexander (Alexander-Adams-Alquié-Edebohls) the principle of which is the shortening of the round ligaments in the inguinal canal. It has the disadvantage of not permitting inspection of the pelvic organs for adhesions, or the appendix, unless the internal rings be opened. This can easily

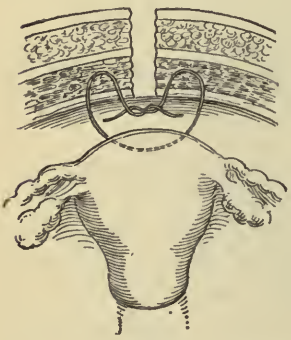


FIG. 154.

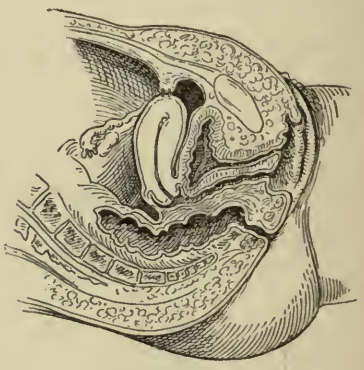


FIG. 155.

FIG. 154.—The suspension stitch in ventro-suspension. When the stitch is tied, and the flap of peritoneum closed over it, the stitch is in the peritoneal cavity, and less subject to cause a persistent sinus should the wound become infected. (*After B. C. Hirst.*)

FIG. 155.—A lateral view of the operation of ventro-suspension of the uterus completed. Notice how the bladder is cramped for room. (*After Crossen.*)

be done, however. It has a limited field, as there must be no suspicion of pelvic adhesions, and the patient must not be fat. It has, when properly done, very few failures and withstands subsequent child-birth well.

(2) The Pfannenstiel transverse incision, combined with the Alexander operation. This permits the inspection of the appendages, the removal of the appendix, and also utilizes the round ligaments for support of the uterus. It is appli-

cable to any case, and has the good features of the Alexander operation without its limitations.

It has some objectionable features: (1) Danger of injury to the bladder, in opening the peritoneum, as the wound is very near the symphysis; (2) difficulty in removing a badly adherent appendix, because of limited room; (3) deep-seated hematomata due to extensive separation of muscle under the fascia, are not uncommon and cause prolonged drainage; (4) it is technically difficult, or impossible, if the patient is fat.

(3) Ventrosuspension of the uterus to the anterior abdominal wall. It will not withstand future child-bearing, though effective until the patient has another child.

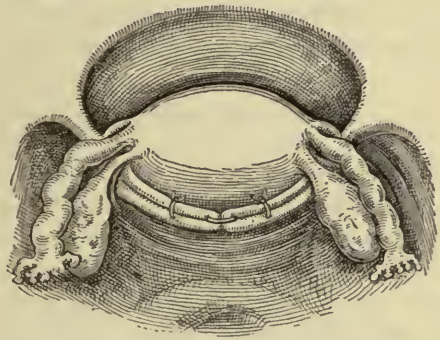


FIG. 156.—The Baldy operation for retroversion; seen from above and from behind. (*After Graves.*)

(4) Baldy operation of bringing the round ligaments through the broad ligaments, under the ovarian ligaments, and sewing the loops together behind the uterus. (The Webster operation is the same, except that the loops of the round ligament are not drawn together behind the uterus.)

(5) Gilliam operation, where the round ligaments are brought through the rectus muscle and peritoneum, to either side of the abdominal incision at its lower end, and the loops of the ligaments sewed together and to the rectus. It does not leave the uterus in normal position. (The Mayo operation is a modification of this; the round ligaments being caught at

the internal ring, and pulled over to the midline, in the incision, between the fascia and the muscles).

(6) Coffey operation, where the round ligaments are folded down the anterior face of the uterus to the vesical attachment and back again to the cornu, and secured by sutures. This will not withstand subsequent child-birth.

All the vaginal operations for retroversion are attended by difficulty in subsequent child-birth, and are not to be recommended in women of child-bearing age.

The indications for operative treatment are: (1) adherent retroversion, where attempts at reposition have failed; (2) where the pessary has failed to cure, and further wearing of the instrument undesirable; (3) working women, unable to afford the time, attention and semi-invalidism required by the pessary.

PELVIC INFLAMMATION

Under this head is considered the moderate infections of the parametrial connective tissue, not including those requiring operation. These latter will be found under the complications of puerperal sepsis.

Symptoms.—(1) Pelvic pain, worse on the left side usually, markedly increased by being much on feet, or by constipation; (2) usually bladder irritability; (3) moderate fever (100°) and moderate leukocytosis (16000); (4) the uterus is fixed, the cervix cannot be moved by the examining finger without pain; (5) the bases of both broad ligaments and, to a lesser degree, the connective tissue of Douglas pouch and the vesico-uterine space, are indurated; (6) there is no other palpable pelvic mass.

Treatment.—(1) Hot vaginal douching, three times daily, using mild astringents or antiseptics, never powerful ones. The water should be as hot as the patient can stand, usually 120° F., and the directions already given should be observed; (2) application of tincture of iodin (7 per cent.) to the vaginal vaults twice or three times a week; (3) boroglycerid (25 per

cent. boric acid in glycerin) or ichthyol (50 per cent. ichthyol in glycerin) on wool tampons, three times a week, the tampons being removed after twenty-four hours, and the douching carried out only when the tampons are not in place. Boroglycerid is preferable to ichthyol, as it does not stain the clothing. (4) Bowels kept well open, with magnesium citrate. Any case not yielding to the above, will probably require surgical interference.

DIASTASIS OF THE RECTI

In the last three months of every pregnancy the abdominal recti are gradually separated by the pressure of the enlarging uterus. In cases of hydramnios or multiple pregnancy where the abdomen is overdistended, the separation may be extreme. If an abdominal binder is worn and kept properly tight during the puerperal convalescence, the muscles gradually assume their normal parallel course, and the support of the anterior abdominal wall is not markedly diminished. Where the abdominal binder is not worn, or discarded too soon, or not kept properly tight, permanent separation, with consequent splanchnoptosis and pendulous abdomen will result. The effects of a diastasis are chiefly those of splanchnoptosis and practically a ventral hernia. The patient, if the diastasis is marked, is incapacitated.

Diagnosis is easy. The abdominal skin is flaccid and wrinkled; coils of intestine can plainly be seen moving under the thin skin and fascia; when the patient strains the center of the abdomen rises like a dome, and the edges of the separated muscles can be felt.

Treatment.—A separation of less than four fingers in breadth can usually be disregarded, as the symptoms are so moderate that no relief is needed. Greater separation than this gives symptoms whose severity are in direct ratio to the degree of separation. A moderate case can be relieved, temporarily at least, by an abdominal binder, preferably one which supports the abdomen as well as compresses.

A straight-front corset will give good support; adhesive straps will give temporary relief. Massage and electricity are not likely to have any beneficial effect. Exercises tending to strengthen the abdominal muscles often help the moderate cases greatly, but are useless where the separation is over four or five fingers. All these methods are merely temporary (except possibly after the first labor) and cannot be used in women obliged to do hard work. In these patients, the Webster operation will effect a cure. The principle is a long incision from the ensiform to the pubes, dissecting back the skin and fat on each side to the retracted muscles. In this process the peritoneal cavity is usually opened as the umbilicus is cut across. The small opening is closed at once, and the rest of the operation is extraperitoneal. The sheaths of the separated recti are sewed together without opening them in the middle line, using interrupted chromic catgut number 2 for tension sutures and continuous number 1 chromic catgut stitch for approximation. The tissue lying between the muscles is allowed to arrange itself behind the suture line, and is *not* excised. The excess of the skin is trimmed off, and if desired, a new umbilicus can be made, by a purse-string suture inverting the skin edge, at the proper point.

This operation withstands subsequent labor provided it does not occur too soon after the operation (two years at least) and proper attention is given to the abdominal binder during the puerperium.

FLOATING KIDNEY

Causes.—(1) Loss of the supporting fatty capsule; (2) drag on kidney by movable cecum or colon; (3) secondarily only the relaxation of the lower abdomen by the distention of pregnancy.

Symptoms.—In most cases, symptoms are absent. Only a small percentage (5 to 8 per cent.) require any relief. A dull dragging pain in the loin (nearly always the right) associated with a "sense of looseness" in the corresponding side of the

abdomen. The discomfort is not transmitted down the ureter, as is likely to be in stone. Sudden, sharp attacks of pain, due to the twist in the ureter with temporary hydronephrosis, are common. Often a large quantity of urine is passed, following such an attack of pain. The severity of the symptoms does not depend upon the degree of looseness, and coincident appendicitis is frequent, due to congestion of the appendiceal veins by pressure of the kidney on the mesenteric veins (Edebohls).

Diagnosis.—The patient is arranged flat on her back, with knees flexed on the abdomen. It is impossible, except in thin individuals, to feel the normally placed kidney. The left

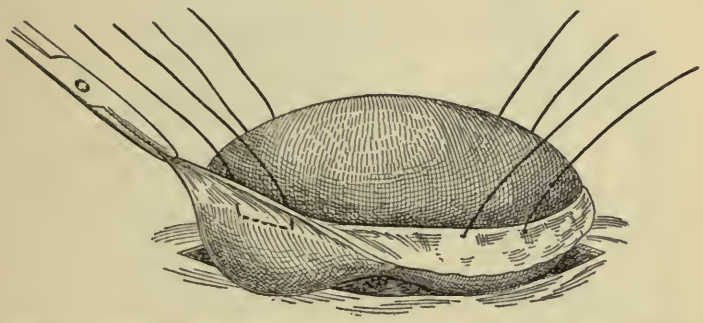


FIG. 157.—Nephrorrhaphy. Shows the method of passing the fixation sutures. (*Ashton, after Edebohls.*)

hand is placed flat under the left flank, and pressed upward, while the right hand makes counter pressure on the abdomen, just below the costal margin. The patient takes a deep breath and then exhales quickly. The smooth, elastic body of the kidney is unmistakable. As the kidney is often low, the examination should extend as far down as the pelvic brim. In doubtful cases, the pelvis of the kidney may be injected and an *x*-ray will show its position. Pyelography is not entirely safe however, as extensive penetration of the silver salt into the parenchyma of the kidney will sometimes occur.

Treatment is only required when definite symptoms demand relief. Muscular exercise, full diet and a properly fitting ab-

dominal binder, with a pad, will relieve the moderate cases. Where Dietl's crises of pain occur, however, or in very low and very movable kidneys, operation is required. The principle is decapsulation of the kidney, with suspension by stitches through the capsule against the cut edge of the quadratus lumborum, outside the erector spinæ just below the last rib. The kidney should not be fixed too high, above the last rib, as it is likely to rotate over the points of support. The kidney thus fixed, is always palpable, and the patient should be informed of this fact, to avoid errors of diagnosis in any future examinations.

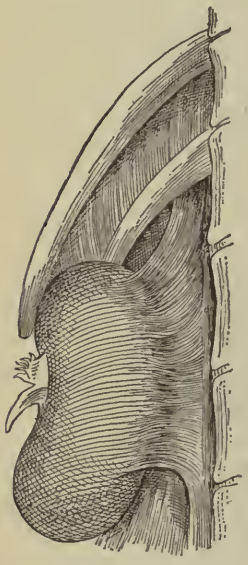


FIG. 158.—The type of adhesion and the position of the kidney (upper pole at the last rib) as secured by the Edebohls' nephrorrhaphy. (*After Edebohls.*)

ECTOPIC KIDNEY

Ectopic kidney is the congenitally low kidney, at, near or even below the pelvic brim. The vessels come from the internal iliacs, and the ureter is short, hence the reposition to its normal position is impossible. Diagnosis can be made definitely by catheterizing the ureters with *x*-ray catheters and *x*-ray picture. The condition is of no importance except in labor, but should be excluded before any attempt at reposition of the kidney is made.

FRACTURE OF COCCYX

Fractured coccyx is most common in justominor pelves, especially where forceps have been used, and in elderly primiparæ. The injury may occur spontaneously. It is most commonly a rupture of the joint between the first and second pieces of the coccyx.

Mechanism.—The mechanism of a fracture of the coccyx, resulting in permanent mobility is first a fall, where the coccyx is driven in the pelvic canal, rupturing the posterior longitudinal ligaments, and causing the coccyx to project much further than normal into the pelvic canal. In labor, the head pushes the coccyx in the opposite direction, causing a rupture of the anterior longitudinal ligament, and a separation of the joint between the first and second pieces.

Terminations.—(1) The coccyx may ankylose inward (into the pelvic canal) when spontaneous cure results, until the next

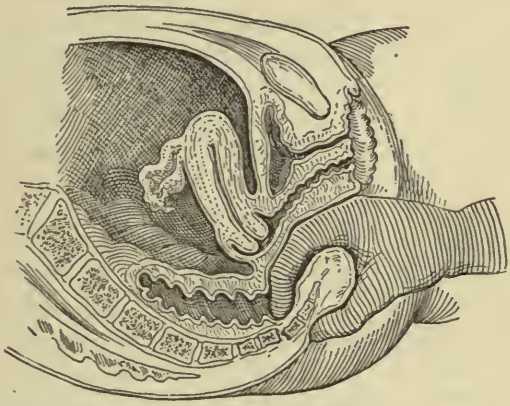


FIG. 159.—Testing the coccyx for fracture by separating the fragments. (*After B. C. Hirst.*)

labor breaks it again; (2) ankylosis backward, in a straight line, so that the patient sits upon the tip of it, like a nail; (3) permanent painful mobility, coccygodynia—much the commonest. The first requires no treatment, the others require removal of the bone.

Causes of Coccygeal Pain.—Pain is not always due to injury of the bone. The causes of coccygeal pain are: (1) Injury; (2) reflex (from retroversion of the uterus); (3) rheumatic; (4) neurotic. It should be an invariable rule *never* to remove the coccyx unless injury can be demonstrated.

Symptoms of Painful Mobility.—(1) The patient complains of pain at the end of the spine on walking, sitting or particularly on defecation; (2) she has difficulty in arising from a chair; (3) she sits on one buttock, and cannot remain long in one position.

Diagnosis.—With the patient in the Sims (left lateral) posture, one forefinger, protected by a finger-cot or glove, is inserted in the rectum and the coccyx grasped between this finger and the thumb outside. There is normal anteroposterior motion of about 1.5 cm. If the coccyx can be moved laterally; if the movement causes pain, and if by pressure a step can be made between the upper and lower fragments, the bone is injured. *X*-ray does not show the injury.

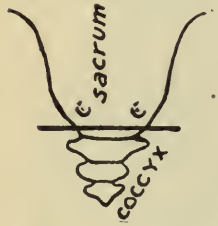


FIG. 160.—The line of amputation in coccygectomy. The last piece of the sacrum has tubercles but no lateral alæ; the first piece of the coccyx has lateral alæ but no tubercles. The line of amputation lies between them.

Treatment.—At least six months after labor should be allowed, for possible spontaneous ankylosis. A mild ointment (1 or 2 per cent. iodin) may be used externally over the bone, chiefly as a placebo. If spontaneous cure is not effected, or if the coccyx ankyloses backward, its removal is indicated. The coccyx is exposed by an incision over it, as far from the anus as possible. The bone is dissected loose from its attachments with scissors, care being taken not to wound the rectum, which is close underneath. The dissection is carried above the lateral alæ on the first piece of the coccyx, and the bone amputated with a Gigli saw between these alæ and the tubercles marking the last piece of the sacrum. It is important that *all* the coccyx be removed; amputation through the ruptured joint will not relieve the symptoms. The median sacral artery is tied, the deep wound drained with a few strands of silkworm-gut (horsehair drain) and closed with interrupted stitches of silkworm-gut, so that all dead space is obliterated. Serious infection may result if

the wound is improperly closed. It is dressed with gauze and collodion, and kept as clean as possible. The stitches are removed in two weeks.

RECTOCELE

Rectocele is caused by a bulging forward of the anterior wall of the rectum, covered by the posterior vaginal wall, through a tear in the fascia between the levator ani and deep transversus perinei muscles, and the triangular ligament. The patient will usually mistake the condition for prolapse of the uterus.

Diagnosis.—With the patient in the dorsal position, the labia are separated, and she is asked to strain. The bulging forward of the rectocele is obvious.

Treatment.—Proper repair of the perineal floor and body, as described under lacerations of the birth-canal.

CYSTOCELE

Cystocele is a bulging downward of the bladder and anterior vaginal wall.

Causes.—(1) Laceration of the muscle of the urogenital trigonum; (2) diastasis of the anterior vaginal fascia; (3 elongation of the uterovesical and cardinal ligaments.

The most important predisposing cause of a cystocele is traction by forceps, particularly axis-traction forceps, before the head had passed through the cervix, and improper direction of pull on the forceps at any stage (outward instead of downward until the head is under the pubic arch). The injury does not appear until several months or even many years after labor. Its proper correction is one of the as yet unsolved problems in gynecology.

Symptoms.—(1) The patient complains of some protrusion from the vulva, which she is likely to call uterus; (2) vesical irritation, from decomposition of urine in the pouch below the urethra.

Diagnosis.—With the patient in the dorsal position, the labia separated, she is asked to strain. The protrusion of the anterior vaginal wall is apparent. It is not advisable to test the position of the bladder by the insertion through the urethra of a sound. There is great danger of injury to the vesical mucosa. A suburethral abscess, from Skene's glands, looks not unlike a cystocele, but the absence of bulging on straining and the brawny feel should make the diagnosis easy.

Treatment.—Palliative by the globe, ball-and-stem, Schatz, Menge or Gehrung pessaries. The palliative treatment is never curative, and is simply a crutch.

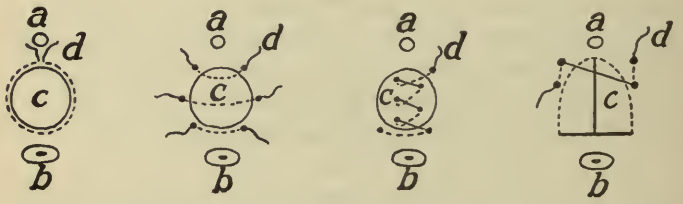


FIG. 161.—Operations for cystocele. From left to right: 1. Stoltz purse string operation. 2. Old oval denudation. 3. Martin operation. 4. B. C. Hirst operation. *a*, Urethra; *b*, cervix; *c*, denuded area; *d*, stitch.

Operative Treatment.—There is no single operation applicable to all cases. The age of the patient, the degree of cystocele, and the method of its production must be considered.

The Watkins-Freund-Wertheim operation of interposition of the uterus under the bladder, by opening the anterior vaginal vault is the surest cure, but is not to be done where any further child-bearing is to be expected, unless the patient is artificially sterilized, by resection of the fallopian tubes at the uterine cornu. It is the only method to be depended upon in very large cystoceles, particularly those occurring very soon after delivery by axis-traction forceps.

The Martin operation of oval denudation and tier suture of number 1 chromic catgut answers very well in moderate cases, provided the denudation is carried far enough out to each side to include the retracted fascia.

The Goffe operation of opening the anterior vaginal vault and suspending the bladder to the fundus uteri and upper portions of the broad ligaments, is successful in bad cases where further labors are to be expected.

The B. C. Hirst operation of exposing the retracted fascia by a T incision and dissection of the vaginal wall, freeing the bladder laterally and from below by cutting the uterovesical ligaments, and sewing the fascial edges together under the bladder is for moderate cases only.

In very severe cases, it may be necessary to open the abdo-

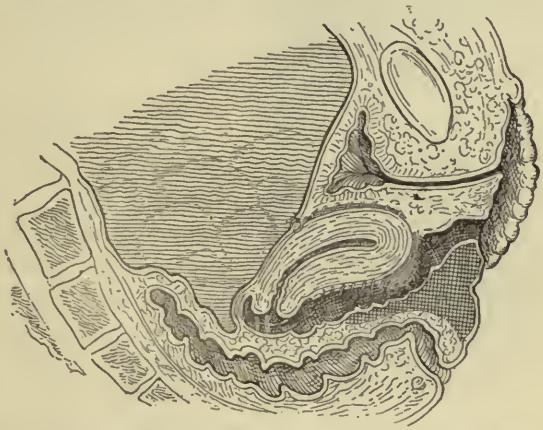


FIG. 162.—The position of the uterus and its relation to the bladder after the Watkins-Wertheim operation of interposition. (*After Crossen.*)

men and sew the bladder fan-shaped to the anterior abdominal walls. By one of these methods, practically any case can be managed, but no single method answers for every case.

PROLAPSE OF THE UTERUS

While the great majority of cases result from the injuries of child-birth, there are other causes: (1) Sudden severe muscular effort; (2) constant muscular shocks (as in a chronic cough); (3) rupture of an ovarian cyst (the weight of the fluid in the lower abdomen acting as a mechanical cause).

Too early rising after labor, with the resumption of hard work, associated with unrepaired lacerations is the commonest cause of prolapse. A predisposing factor is forceps delivery through a partially dilated or partly effaced cervix, axis-traction forceps, or improper direction of pull in any forceps operation.

Symptoms.—(1) Loss of support, felt worst toward evening, when the patient has been on her feet all day; relieved by rest in bed; (2) complaint of protrusion through the labia of the cervix or other portion of the uterus (depending upon the degree of prolapse).

FIG. 163.—Prolapse of the uterus and rectum. (*Author's case, Philadelphia General Hospital.*)

The degree of prolapse is named from the position occupied by the cervix, when the patient is in the erect posture. A prolapse in which the uterine body emerges from the vulva, is called complete, or procidentia uteri.

Diagnosis is easy. The cervix, or more of the uterus, is seen to protrude between the labia. It is important not to make an examination when the patient has been some time in bed or just after the removal of a pessary, as the true degree of prolapse may not be apparent. Cystocele is almost always marked, and usually forms the greater part of the protruding mass. The vaginal mucosa is usually thickened and rough, and may be the site of extensive ulceration.

Treatment.—Palliative treatment is never curative. It is indicated only in patients in whom there is a contra-indication to operation. It consists in support by some form of pessary.

Those in common use are: (1) The globe or ball pessary—a hard rubber ball of sufficient size, held in place by a perineal napkin. (2) The soft rubber ring—looking like a large cruller—mentioned only to be condemned. It becomes very foul after a short time. (3) The ball-and-stem pessary, held in place by an abdominal belt and perineal straps—cumbersome but effective. (4) The Goddard pessary—an aluminum ring, held in place by a semicircular wire support, fastened to a bandage around the patient's waist—cheap and effective. (5) The Menge pessary—a heavy hard rubber ring with a detachable bulb fastened at right angles, to prevent the ring from turning sideways and dropping out—better than any of

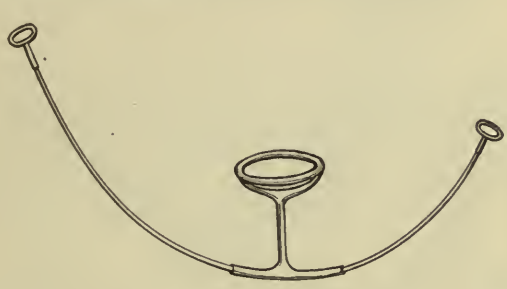


FIG. 164.—The Goddard pessary for prolapse, cheap and efficient, but requires a bandage around the waist for support.

the preceding. (6) The Schatz doorknob pessary, similar in action to the Menge, but not so efficient. Any patient wearing a pessary for prolapse must be kept under constant supervision, as the pessary is likely to prove irritating, and should be inspected at least once a month.

Operative treatment depends upon the type of prolapse. That seen in nulliparous women is almost always a simple hypertrophic elongation of the cervix, which amputation of the cervix alone will cure. Usually the operative measures required are: (1) Amputation of the cervix; (2) dilatation and curettage (done *after* the amputation because the cervix is usually too long for effective dilatation; (3) interposition

operation for cystocele; (4) extensive perineorrhaphy. If these procedures be properly carried out, any abdominal operation for prolapse is unnecessary. A common mistake is to perform vaginal hysterectomy. This should *never* be done unless there is uterine carcinoma and should be followed by

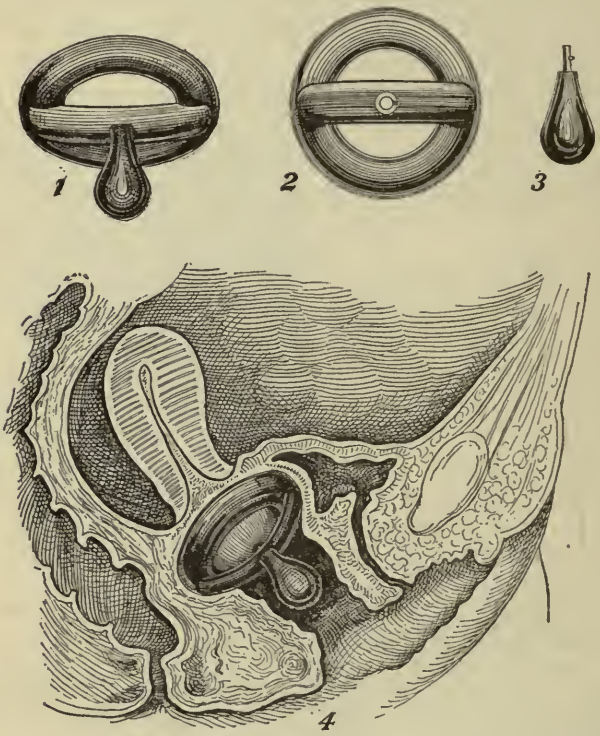


FIG. 165.—The Menge pessary for prolapse. Showing its position when inserted.

plastic work on the anterior and posterior vaginal walls, to prevent inversion of the vagina, which will surely follow if this be neglected. Neither vaginal hysterectomy nor ventrofixation of the uterus will cure prolapse of the uterus, unless combined with extensive vaginal repair.

If the vaginal mucosa is ulcerated, the ulcers should be treated with nitrate of silver (40 gr. to the ounce) and boroglycerid tampons, and allowed to heal before any operation be attempted. Most operations for prolapse are done at an age when further child-bearing is unlikely. In young women, however, laceration is likely to recur at any future delivery, but proper repair at that time will usually prevent any recurrence of the prolapse.

FIG. 166.—Schatz's door-knob pessary for prolapse of the uterus. Not quite so efficient as the Menge, but based upon the same principle.

INCONTINENCE OF URINE

Incontinence of urine after delivery is due to: (1) Paralysis of the vesical sphincter; (2) overflow from retention; (3) laceration of the urogenital muscle (compressor urethræ); (4) fistula; (5) retroversion of the uterus.

The **symptoms** are obvious. There is leakage of urine, either constantly or upon any exertion.

The **diagnosis** of the cause may be difficult. The incontinence of overflow is easily overcome by the catheter (soft rubber or silk and *not* glass). That due to fistula can be managed only by the closure of the fistula. Incontinence only upon sudden muscular effort is almost always due to laceration of the muscle of the urogenital trigonum, the repair

of which will be found described in the chapter on injuries of the birth-canal. If none of these causes are responsible, the cause is paralysis of the vesical sphincter. Moderate cases tend to recover spontaneously. Cases of long standing are exceedingly difficult to treat. Large doses of strychnin (gr. $\frac{1}{20}$ four times a day) over a long period and the slow interrupted faradic current, one pole in the urethra and the other on the abdomen, applied for 45 minutes every day will often hasten a cure. If a reasonable trial fails, injections of paraffin (melting point 110° F.) are often successful. The injections are made in the tissues between the anterior vaginal wall and the vesical neck, over the internal urinary meatus. It is best to make them like a dumb-bell, the knobs in either side of the vesical neck, and the transverse bar across it. The effect is that due to slight pressure. In otherwise intractable cases, surgical methods are: (1) Shortening the vesical sphincter; (2) extensive cystocele operation; (3) interposition operation. They should be tried in this order.

If the uterus be retroverted, reposition will often control the incontinence.

GENITAL FISTULÆ

The causes of genital fistulæ are: (1) Sloughing from continued pressure in obstructed labor—now rare, due to better management; (2) lacerations from violent delivery or slipping forceps; (3) abscess; (4) tuberculosis; (5) syphilis; (6) cancer—in its later stages.

Kinds.—A long list of fistulæ may be made by connecting in every possible way the bladder, vagina, rectum, ureter, intestine, uterus and urethra. By far the commonest are, in order: (1) Vesicovaginal; (2) Rectovaginal; (3) Ureterovaginal; (4) Vesicocervicovaginal.

Diagnosis of Vesicovaginal Fistula.—The patient complains of constant dribbling of urine; usually excoriation of the labia and thighs, and, if the fistula is of long standing, cicatricial contractions of the vagina. In very small fistulæ there may be

leakage only in certain positions, or when the bladder is full. Almost always there is a complicating cystitis. The demonstration of a fistula may not be easy. Large ones can usually be seen at once, but a small fistula may be so hidden by a fold of the vaginal mucosa, that it is difficult or impossible to see. If the fistula cannot be seen (usually near the cervix and toward one vaginal vault) when the vagina is expanded by a bivalve speculum, other means of diagnosis must be used. (1) Searching with a probe—a rather clumsy method; (2)

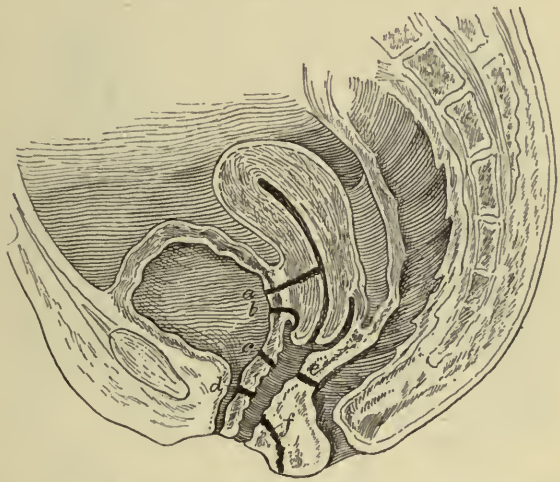


FIG. 167.—Fistulæ of the genital organs: *a*, Vesicouterine fistula; *b*, vesicocervical fistula; *c*, vesicovaginal fistula; *d*, urethrovaginal fistula; *e*, rectovaginal fistula; *f*, perineovaginal fistula. (*Beigel.*)

cystoscopy, as the bladder end of the fistula is usually easy to see, and a probe or ureteral catheter can then be passed through it; (3) injection into the bladder of colored fluid, when its point of leakage can be seen. The best fluid is sterile milk, and four ounces is enough If the fistula is so small that leakage only occurs in the erect posture, the bladder may be injected with 2 per cent. methylene-blue solution, pledgets of cotton placed in the vagina and the patient allowed to walk

about for a few minutes. The pledget of cotton marking the site of the fistula will be stained blue. By these injections, incontinence due to paralysis of the vesical sphincter may be excluded.

Treatment of Vesicovaginal Fistula.—No attempt should be made to repair the fistula until puerperal involution is complete. Two or three months after labor is the most favorable time. Very small fistulæ may be made to heal by cauteriza-

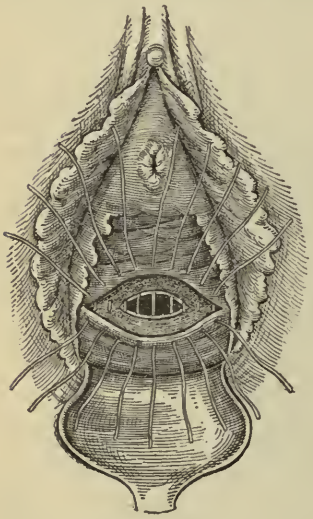


FIG. 168.

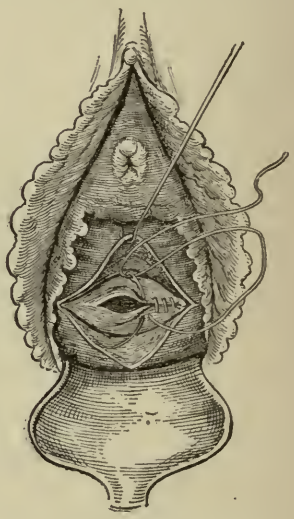


FIG. 169.

FIG. 168.—The simplest form of operation for vesicovaginal fistula.
FIG. 169.—The flap-splitting operation for vesicovaginal fistula.

tion with nitric acid or a red-hot probe or electric needle. This method is not safe, as it may cause the fistula to enlarge instead of heal. Usually, the steps of repair are: (1) For at least a week before operation, the bladder should be flushed with boric acid solution, twice daily; (2) for the operation, the patient is anesthetized, placed in the dorsal (or Sims') position, and prepared locally as for a plastic; (3) the fistula is located, and denudation is made around it,

down to but *not through* the vesical mucosa; (4) the edge of the fistula is split, so as to separate it from the anterior vaginal wall; (5) the bladder wall is closed with interrupted number 1 chromic catgut or linen thread stitches; (6) the vaginal mucosa and fascia is closed over the bladder wall by interrupted stitches of linen thread. The denudation should be so planned that as little tension on the stitches as possible will result; (7) the bladder is kept from overflowing by a permanent mushroom catheter, or better by catheterization every four hours, as the permanent catheter is likely to cause troublesome cystitis.

The linen stitches are removed in two weeks. Complete success is not common at the first trial, and re-operations are common. If the vagina is the seat of cicatricial contraction, the bands must be cut, the vagina dilated with glass plugs and the normal elasticity restored as far as possible, before any repair is attempted. Syphilitic, tubercular and cancerous fistulæ should not be touched surgically as they are impossible to repair. Very large fistulæ, so large that no flaps can be made by dissection and undermining of the edges may be treated in one of three ways: (1) Opening the anterior vaginal vault, anteverting the uterus, and sewing the uterine body, as a plug, in the opening in the bladder; (2) complete closure of the vagina—colpocleisis—so that the bladder and vagina form one cavity. This is so often followed by ascending infection of the ureters, pyelonephrosis and fatal sepsis, that its use seems unjustifiable; (3) implantation of the ureters into the bowel. This is open to the same objections as colpocleisis.

Diagnosis of Rectovaginal Fistulæ.—The patient complains of passing fecal matter and gas through the vagina. The same symptoms occur in tear of the sphincter, and the patient is unable to distinguish between them. The fistula is usually easy to see, and is most often just inside the vagina or on the perineum. Milk may be injected and its point of exit noted.

Treatment of Rectovaginal Fistulæ.—Repair is much easier and more certain of success than in vesical fistula. An oval

denudation is made around the fistula down to but not including the rectal mucosa. The edge of the fistula is split, to separate the rectal wall.

The opening in the rectum is closed with number 1 chromic catgut, interrupted stitches, and the vaginal wall closed over it. The bowels are kept loose from the start, two movements a day being required.

Before any attempts is made to close an apparent recto-vaginal fistula, *anus vestibularis* must be excluded. In these cases the anus opens just inside the vaginal orifice, and has all the appearance of a fistula. A little care in diagnosis will prevent this mistake. Here also syphilitic, tubercular, and cancerous fistula cannot be repaired.

Diagnosis of Ureterovaginal Fistulæ.—Constant dribbling of urine irrespective of the patient's position, but in amounts smaller than would be expected if a vesicovaginal fistula. No opening from the bladder can be found, but the fistula, or at least the source of the urine, can usually be seen in one vaginal vault. These fistulæ are most common in high forceps deliveries, or in rapid delivery of a breech or in version. Such a history may help in directing attention to the site of the fistula. If the fistula cannot be seen, a hypodermic injection of indigo-carmin (2 mils) is given. Then by placing a cotton pledget near the supposed site, the blue stain on the cotton will serve to locate it.

Treatment of Ureterovaginal Fistulæ.—Either implantation of the ureter into the bladder by the vaginal route—colpo-ureterocystostomy, or by the abdominal route—laparo-ureterocystostomy. Implantation of the ureter in the bowel is sure to cause ascending infection and pyelitis and is not to be recommended.

Vesicocervicovaginal fistula, from violence in forceps deliveries or too rapid extraction of the child after version or in a breech presentation, is one of the most difficult of fistulæ to treat. The urine can be seen emerging from the cervix. The only way to close the opening is to dissect the anterior

vaginal wall from the bladder, free the bladder by cutting the uterovesical ligaments, and closing the fistula in the bladder, which is thus exposed, by interrupted sutures of linen thread. It is, fortunately, rare.

It is difficult to lay down any set rules for operation for a condition in which each case is a separate problem. The method of closing genital fistulæ must be adapted to the needs of the individual case. The foregoing is merely an outline of typical cases.

CHAPTER XV

DISEASES OF THE PUERPERIUM

Anemia (puerperal) is usually not a true anemia, but simply a delayed return to normal from the hydremia and leukocytosis of pregnancy. Ordinarily the involution of the blood is practically complete within two weeks after delivery, but may be delayed by severe illness in pregnancy, hemorrhage, nephritis or sepsis. The most useful treatment is: (1) Full diet with high protein food (meat, meat soups, etc.); (2) Blaud's pills 5 gr. four times daily; or (3) iron pyrophosphate, gr. v, arsenious acid gr. $\frac{1}{60}$, strychnin sulphate, gr. $\frac{1}{30}$ four times a day. In severe cases or those in which pernicious anemia seems imminent, blood transfusion (250 to 500 mils) is indicated.

The Exanthemata and Acute Intercurrent Diseases.—A puerperal patient is more susceptible to infection from any contagious disease; the disease is likely to be more severe than normal; the mortality is higher than usual.

Scarlet fever is rare. The point of infection is either the throat or wounds in the genital canal. This latter is the more common, and the incubation period is five to seven days, although it is sometimes shortened to twenty-four or forty-eight hours. The symptoms are the same as ordinary scarlet fever except that (1) the disease appears almost always in the first three days of the puerperium; (2) throat symptoms are slight; (3) the rash is likely to be dark red; (4) nephritis is much more common. The prognosis is unfavorable, the mortality being about 50 per cent.

Treatment is the same as ordinary scarlet fever; special watchfulness for nephritis and prohibition of nursing the baby being the chief points of difference.

Measles is also rare. When it attacks a pregnant woman, abortion is very common. In the puerperium the danger is considerable; hemorrhage from the uterus is common, and the chief and most dangerous complication is pneumonia.

Small-pox is much more severe in the puerperium, but fortunately rare.

Erysipelas is frequently seen as a complication of puerperal sepsis, and sepsis is often caused by erysipelas—the micro-organism of septicemia and erysipelas (the Streptococcus pyogenes) being practically identical. Facial erysipelas is rare. When erysipelas occurs in pregnancy, the site is rarely if ever the genitals; when it occurs in the puerperium it is nearly always in the genitalia.

Symptoms.—If remote from the genitalia, the fever, red skin, brawny skin, obvious sepsis are distinctive. In the genitalia, it is impossible to diagnose from ordinary streptococcic infection, unless the source of infection be known.

Treatment.—Remote from the genitalia, the same as ordinary erysipelas. Genital erysipelas is treated as puerperal sepsis.

Prognosis.—Remote from the genitalia, the prognosis is good, unless the case be of the rapidly spreading type. In the genital infection, the mortality is 50 per cent.

Diphtheria.—In the throat, it is an accidental complication. In the genitalia, the diagnosis can be made bacteriologically only. The exudate does not differ in appearance from that seen in ordinary streptococcic infection.

Malaria is somewhat modified by the puerperium. It predisposes to hemorrhage; the milk often disappears, to reappear after the chills and fever have ceased; the fever is first continuous, then intermittent, but does not become normal between intermissions. The third day after delivery is the commonest date of onset.

Diagnosis.—By finding the protozoa in the blood.

Treatment.—Quinin in larger doses than usual—forty to seventy-five grains a day. The quinin does not affect the milk.

Arthritis is due to acute rheumatism, puerperal sepsis or gonorrhea. If rheumatic, large doses of salicylates are required. If a complication of sepsis, it is usually in the knee, ankle or shoulder, in that order of frequency. The course is long, three to four months, suppuration is likely, ankylosis occurs in at least 60 per cent. If *gonorrheal*, the commonest joint is the ankle, the risk of ankylosis 20 per cent.

In *septic arthritis*: (1) Immobilization of joint; (2) paint skin with iodin; (3) apply saturated magnesium sulphate dressing; (4) ice-bag over the dressing; (5) open if suppuration occurs; (6) passive motion as soon as the acute symptoms are over—to guard against ankylosis.

In *gonorrheal arthritis*, the treatment is the same, with in addition large doses of gonococcus vaccine, either stock or autogenous; 1000 million bacteria are given at a dose, repeated daily for several doses. Gonorrheal arthritis is very rare in women, except after child-birth or miscarriage.

Gonorrhea is always aggravated by pregnancy, the child's eyes are often infected, and severe sepsis, from a mixed infection, is not uncommon in the puerperium. There is often a rapid development of a pyosalpinx, often bilateral, and the previous gonorrheal infection makes a streptococcic infection more likely and, when it does occur, much more severe.

Treatment in the puerperium is the same as gonorrhea in general except for the greater likelihood of surgical complication.

Pneumonia is much more serious in the puerperium. It is most frequent in pregnancy, but as it so often causes premature termination of pregnancy, it is frequently seen in the puerperium as well. While the induction of labor would seem rational, it is dangerous, and to be avoided. Shock is to be feared, and the later in pregnancy, the more grave the prognosis.

The *treatment* is the same as ordinary pneumonia, except for combating the shock after delivery, and the greater need for stimulation in the puerperium.

Fever may be infectious or non-infectious. The commonest cause of non-infectious fever are: (1) Engorgement of the

breasts; (2) exposure to cold showing itself in other ways than engorgement of the breasts; (3) constipation; (4) syphilis (this being an extremely irregular fever, with wide variations in a short time). The common mistake, of ascribing every case of fever in the puerperium to septic infection, should be avoided.

Granulation Tissue after Repair of Perineum.—It is common to have a patient complain of pain after repair, due to exuberant granulation tissue along the suture line. Inspection will show the cause of pain, and one or two applications of solid stick nitrate of silver will permanently remove it.

Hematoma is an interstitial effusion of blood, varying in size and shape, situated anywhere from the broad ligament to the vulva, but most commonly in one labium majus. In the labium it is sausage-shaped; elsewhere in the canal it is likely to be globular.

Cause usually spontaneous rupture of a vessel with subcutaneous effusion of blood, usually during the second stage of labor. It maybe due to injury by forceps, or excessive tractive efforts (here in the broad ligament).

Symptoms.—(1) Sharp pain in the second stage of labor, like that of tearing tissue; (2) pain often exaggerated as the hematoma increases in size; (3) appearance of a purple swelling, usually in one labium; (4) hematoma in the vagina or cervix appearing like a large but adherent blood-clot; (5) hematoma in the broad ligament diagnosed by bimanual examination, as a globular mass; (6) physical signs of loss of blood, though these are rare unless the hematoma has ruptured.

Diagnosis should be easy. It has been mistaken for blood-clot, varicose veins, or inverted uterus.

Termination.—(1) Spontaneous rupture, with excessive and sometimes fatal hemorrhage; (2) suppuration; (3) resolution. If a vaginal hematoma suppurates, fistulæ are common.

Treatment depends upon the situation.

Labial Hematoma.—(1) Rest; (2) moderate perineal pressure; (3) cold; (4) no opening unless it suppurates. The

hematoma should not be opened while it is increasing in size, unless the patient shows alarming signs of hemorrhage.

When opened, it should be done freely, any visible vessel tied and the cavity packed with iodoform gauze; the gauze changed and the cavity irrigated daily.

Vaginal Hematoma.—(1) Pressure by means of a rubber bag (colpeurynter) filled with ice water, changed frequently; (2) if possible to avoid, no opening while the tumor is increasing in size; (3) if any suppuration, or if resolution delayed, open and pack with iodoform gauze.

Cervical hematoma same as vaginal.

Broad ligament hematoma should be given time to undergo resolution, as it will if no large vessel is injured. If the patient shows physical signs of loss of blood; if the hematoma increases in size; or if it ruptures, abdominal section is required. These hematomata should never be approached through the vagina. It may be necessary to do hysterectomy to control the bleeding.

Puerperal hemorrhage is due, most commonly, to (1) Retained placenta and membranes (secundines); (2) displacement of the uterus; (3) dislodged clots at the placental site; (4) retention of blood-clots; (5) tumors, either benign (fibroid) or malignant (carcinoma uteri or chorionepithelioma). Hemorrhage from relaxation of the uterus is very rare after the first twenty-four hours after labor.

Retained Placenta or Membranes.—The placenta and membranes should be carefully examined, directly after their delivery, to see if any portions of them are missing. Any missing portion of the placenta is removed at once, preferably by the hand protected by a sterile glove, and after careful cleansing of the patient. Usually retained portions of the membranes do not justify interference to remove them; they are passed spontaneously within forty-eight hours.

A placenta succenturiata may be retained, even though examination of the placenta shows no portion to be missing, or bleeding may be caused by hypertrophied angiomatous decidua. At any time except during the twenty-four hours

immediately following delivery, evacuation of the uterus is best done with Emmet curettement forceps and, for decidua, a broad blunt curet, and not with the hand.

Displacement of the uterus causes moderate oozing, usually beginning after the tenth day, when the uterus is sufficiently involuted to drop past the promontory. Reposition of the uterus, in the knee-chest posture, will control the bleeding.

Dislodged clots at the placental site cause sharp bleeding, almost always following sudden exertion. It is the most dangerous of all puerperal hemorrhage, and requires packing of the uterus and vagina to control it.

Retention of blood-clots causes a discharge of small clots and bloody serum, rather than actual hemorrhage. The fundus uteri is usually much higher than normal, and compression of the uterus will usually cause clots to be discharged from the vagina. Flushing with sterile water is the best means of removing the clots. Thirty drops of fluidextract of ergot three times daily, by mouth, for two days, will prevent their re-occurrence.

Fibroid tumors, causing bleeding in the puerperium, demand removal. Chorionepithelioma, diagnosed by microscopic examination of the scrapings from the uterine cavity, demands immediate panhysterectomy.

Relaxation of the pelvic joints not infrequently persists after labor. The joints may be simply abnormally mobile, or injured by forceps, or the seat of active inflammation and suppuration—the latter frequently a complication of injury.

Diagnosis.—(1) Difficult locomotion and great pain on attempting to change position or to walk. (2) Walking is usually difficult or impossible. (3) By examination, in the erect posture, the abnormal mobility of the joints is noticeable. (4) *X*-ray picture may show separation or inflammation, and is always worth taking. (5) Suppuration is shown by redness of skin, induration and pain. Suppuration in the symphysis is not dangerous; in the sacro-iliac joints it is a serious and often fatal complication.

Treatment.—(1) Immobilization in bed, with a canvas binder laced so as to immobilize the pelvis. (2) Reinforcement by sand-bags is a help to the binder. (3) If the canvas binder is not satisfactory, broad adhesive straps may be used. (4) Convalescence is slow—eight to twelve weeks as a rule. (5) If there is inflammation and suppuration of the joints, early opening and drainage is required.

Sacral Neuritis.—In justominor pelves, where the projection of the promontory is slight, the trunks of the sacral plexus are subject to undue pressure. The pain usually begins in labor, and often is so severe as to require anesthesia and forceps delivery. After labor it persists as extreme hyperesthesia, often accompanied by partial or complete motor paralysis of the legs (one or both). Pressure in the sacral plexus (by rectal examination) causes marked increase in the pain.

Treatment is rest, immobilization of legs by sand-bags, and, after the acute stage has passed, passive movements, massage and electricity.

Prognosis is favorable, but convalescence is slow.

Subinvolution of the uterus is a retarding of the normal involution of the uterus.

The cause is anything that interferes with the normal reduction of blood supply by interfering with the contraction of the uterus; such as: (1) Retained secundines; (2) lacerations of the cervix; (3) hypertrophied decidua; (4) puerperal sepsis; (5) backward displacement of the uterus.

The *diagnosis* is easy. The fundus can be palpated at a level higher than it should occupy, considering the time after delivery. Directly after delivery the fundus is felt one finger's breadth below the umbilicus; twenty-four hours later it is one finger's breadth above the umbilicus (due to slight relaxation after the effect of ergot has worn off); it then steadily descends until it disappears behind the symphysis in the tenth to fourteenth day. Involution is complete in six to eight weeks on the average.

Treatment is to remove the cause, when the involution will

take care of itself. Involution is more rapid in women who are given ergot and pituitrin after delivery, but continued use of ergot does not correspondingly hasten involution; therefore its routine use, after the initial dose to minimize the risk of postpartum hemorrhage, is not to be recommended.

Superinvolution of the uterus is the too rapid or exaggerated reduction in the size of the organ. It is not common.

The *cause* is obscure. It has been ascribed to pelvic inflammation, hemorrhage, hyperlactation, rapidly repeated pregnancies and many other reasons. There is a moderate form, common in lactation, but occasionally going to extreme diminution in size, called lactation atrophy. The uterine walls are thin, easily perforated and any curettage done in a nursing patient should be done with caution.

Treatment.—Spontaneous resolution or return to normal size is the rule. Recovery may be hastened by electrical stimulation, or by hypodermics of 1 mil corpus luteum extract daily for several weeks, given deep intramuscularly.

Tympanites.—Excessive distention of the abdomen after delivery is not uncommon. It is one of the main difficulties in the after-treatment of cesarean section. It is due to a paresis of the bowel, without peritonitis. There is no fever, and the pulse is not affected. The condition is not one to cause alarm, provided the pulse is not affected. The best routine treatment is: (1) Abdominal binder; (2) five grains of calomel dry on back of tongue; (3) two hours afterward, $\frac{1}{4}$ grain of elaterium by mouth; (4) two hours later magnesium sulphate, ounce 1; (5) if no movement occurs within six hours of the dose of magnesium sulphate, give *high* compound enema of magnesium sulphate $\frac{1}{2}$ oz., turpentine $\frac{1}{2}$ oz., glycerin 1 oz., water up to 1 pint; (6) give routinely pituitrin $\frac{1}{2}$ ampule hypodermically twice daily for three days—eserin salicylate hypodermically gr. $\frac{1}{40}$ every four hours—strychnin sulphate gr. $\frac{1}{30}$ hypodermically t.i.d. In severe cases the bowel may be distended with water and the slow faradic current applied—one pole in the rectum and the other on the abdomen.

In the worst cases the bowel may be punctured, apparently with safety, though this should very rarely be needed.

The routine use of the rectal tube and, as an alternate, high enemas of alum 1 oz. to two pints of water may be given.

Hemorrhoids often become edematous or acutely congested during the puerperium, and cause great pain. The quickest relief is stretching of the sphincter, under nitrous oxid anesthesia; followed by an ointment of cocain gr. 10, ointment of nutgall ½ oz., ointment of belladonna ½ oz.

Urine after Delivery.—There is a tendency to retention, due partly to a paresis of the bladder wall and partly to edema of the urethra from pressure. By waiting twenty-four hours, if possible, the use of the catheter may usually be avoided. The patient may be passing urine, however, and the bladder still be badly overdistended. The lower abdomen should be palpated, routinely, to detect any distention of the bladder.

The total amount of urine per day is increased by about 50 per cent., especially in the first week of the puerperium. Albumen is common. Sugar is usually lactose and therefore negligible, though commonly found.

Hematuria is not uncommon, during the first few days of the puerperium, from pressure on the neck of the bladder in labor. If it persists, especially with frequency or tenesmus, cystoscopy is indicated to exclude stone or papilloma.

Incontinence of urine has been described in the pathologic sequelæ of child-birth.

CHAPTER XVI

DISEASES OF THE BREASTS

Absence.—The breasts are never microscopically absent. While there may be no evidence of any gland tissue, it is said that traces may always be found, by microscopic examination. This is of course of no clinical importance.

Hypertrophy is rather rare. The breasts are usually asymmetrical, the condition is most often (80 per cent.) seen in women under twenty-five years of age. The breasts may be very large—one of sixty-four pounds being reported. The enlargement is usually a fibrous tissue growth, and a profuse flow of milk is not the rule. Nursing the child has been a cause of reduction in size of the glands, hence it is not contra-indicated.

Supernumerary breasts (polymastia) are not uncommon. In the embryo of six weeks, there is a line of cells running from the axilla to the groin—the *crista lactea*. From the thoracic portion of this the breasts are developed. The extension of the crista lactea into the axilla is the most frequent site of accessory breasts, though they may be situated anywhere. Each gland may have its own nipple and secrete milk during lactation. The "swollen gland in the axilla" complained of by so many patients after delivery, is simply an accessory breast.

Abnormalities of the Nipple.—The most important of the abnormalities of the nipple is: (1) Fissured or cracked nipple; (2) inverted; (3) stunted; (4) hollow; (5) mulberry; (6) conical; (7) mushroom.

Fissured nipple may occur in pregnancy, from lack of cleanliness or rubbing of clothing.

It is most common during lactation, in primiparæ, in blonde

or red-haired women rather than brunettes, and in any deformity of the nipple itself. If the condition occurs in pregnancy, cleanliness and protection by a nipple shield will usually suffice.

Symptoms.—(1) Intense pain on nursing and (2) a visible crack in the skin. This fissure usually runs around the base of the nipple, at its lower border, but may occur as a vertical fissure dividing the nipple or as an ulcer anywhere on its

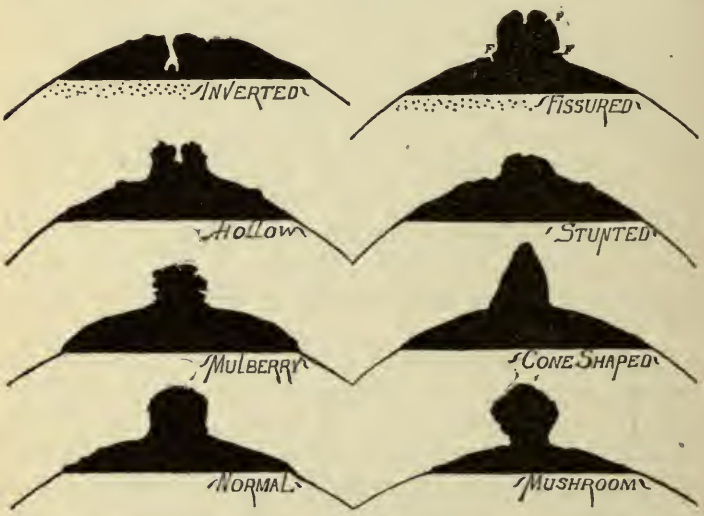


FIG. 170.—Faulty development of the nipple. (*Dickinson.*)

surface. If not easily visible, a reading magnifying glass should be used to search for it. In any case of painful nursing, a fissure should be looked for, at once. The fissure often bleeds when the child is nursed, and if this blood is swallowed by the child, it will appear in the stools—pseudomelena.

Treatment.—If the nipples are sore in pregnancy, and no actual fissure is visible, they should be kept scrupulously clean, protected by a nipple shield and witch-hazel applied to them twice daily.

If the fissure appears during lactation, scrupulous cleanliness

is imperative. The nipple is protected during nursing by a nipple shield (either the Phœnix or Infantibus—the latter much the best). The nipple is washed off with boric acid solution before and after each nursing. After nursing it is dried and an ointment of equal parts of subnitrate of bismuth and castor oil is applied. All these applications are made with sterile cotton pledgets. The nipples are then covered with sterile gauze and a Murphy breast binder applied. Alternative applications are compound tincture of benzoin, applied to the fissure itself; ichthyol 1 dram in 1 ounce each of glycerin and olive oil; solid stick nitrate of silver to the fissure.

FIG. 171.—Nipple-shield. (*Phoenix.*)

It is not safe for the child to nurse without the protection shield until forty-eight hours after the fissure has apparently healed. Should the fissure refuse to heal, or the child be unable to nurse from the shield, a teterelle may be used. This is a form of breast pump in which the mother, by a rubber tube and mouth piece makes the necessary suction to draw the milk into the pump, and the child withdraws it by a separate orifice and tube. It is sold as the number 3 Phœnix breast pump. If this will not work satisfactorily, the child must be weaned.

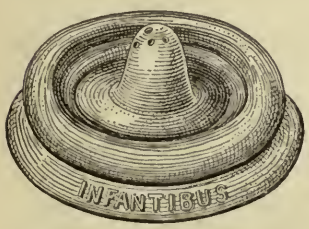


FIG. 172.—Soft-rubber nipple-shield called "Infantibus" will be tolerated in cases of sensitive nipples when the "Phoenix" and others cannot be endured. (*J. P. C. Griffith.*)

Care of Nipple Shields.—Shields must be washed and scalded directly after use, and kept in a closed jar of boracic acid solution (gr. x–oz. i.) so that they are completely covered by the solution. The shield is removed from the solution with dressing forceps, and rinsed in cool sterile water just before use.

Danger of fissured nipple is chiefly infection and breast abscess.

Inverted nipple is an arrest of development. Long-continued use of the breast pump in pregnancy, with moderate suction, will help somewhat, suction being applied for 15 to 20 minutes night and morning. The condition is usually obstinate. Massage with the fingers is somewhat dangerous, due to bruising and infection. The breast pump is more efficient and safer. Inverted nipples are difficult to keep clean, during lactation, they are likely to fissure, and it is impossible for the child to nurse without a nipple shield or a teterelle (number 3 Phœnix pump).

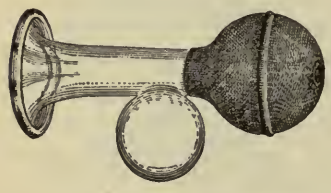


FIG. 173.—Phoenix breast pump. The rubber bulb should be half collapsed only and the edge of the bell greased with vaseline before applying.

Stunted nipple is important only in that it is difficult for the child to nurse. Systematic use of moderate suction with a breast pump throughout pregnancy, will often cause improvement, but the nipple shield is usually required during the nursing period.

Hollow nipples are merely a form of inverted, have the same disadvantages and are treated in the same way.

Mulberry nipples are exceedingly likely to fissure and require care to prevent this complication. If a fissure occurs, it is treated as already described.

Conical nipples make it somewhat difficult for the child to nurse, but the difficulty is not a serious one, and a nipple shield is rarely required.

Mushroom nipples have the same disadvantages as mulberry-fissure—though to a less degree.

Anomalies in the Milk Secretion.—The only fluid in the breasts for forty-eight hours after delivery is a thin, milky fluid, with a high fat and protein content, called colostrum. The milk usually appears suddenly, about forty-eight hours after

delivery, accompanied by considerable painful engorgement of the breasts and often a slight rise of temperature—"milk fever." No attempt, other than gentle massage, should be made to control this engorgement, as it is only temporary. The amount of milk secreted in twenty-four hours is normally 14 ounces by the end of the seventh day; two pints by the end of the fourth week; three pints by the end of the sixth month. From this time on, the quantity tends to decrease.

Milk may be found in the breasts entirely independent of the puerperium, in any condition which causes pelvic congestion. In many women, it is found at every menstrual period.

The onset of lactation may be greatly delayed, even for several months after delivery.

Deficient Secretion (Oligogalactia).—The milk may be entirely absent (agalactia), but this is very rare. The commonest causes of deficient secretion are: (1) Lack of development of breasts; (2) toxemia of pregnancy (eclampsia); (3) sepsis; (4) hemorrhage; (5) heredity. It is not uncommon, when one child has died and lactation prematurely interrupted, for secretion to be deficient after a subsequent delivery. The amount of milk does not depend upon the size of the breast. Excessive nervousness or sudden mental shock, fright or anger affect the quality of the milk more than the quantity. The return of menstruation is usually without effect upon the milk. Pregnancy during lactation usually causes an abrupt disappearance of the milk.

Treatment.—No single plan of treatment is of avail in all cases. Often after sepsis, severe hemorrhage or eclampsia, the secretion of milk will be resumed spontaneously, and in sufficient quantities. If four meals a day, one quart of milk extra between meals and a wineglass of malt or porter with the meals will not cause a sufficient increase, the child must be weaned. Breast feeding and bottle alternating is not advisable except for short periods. There is no proven galactagogue. Corpus luteum extract, extract of the involuting endometrium, pituitrin, whole pituitary gland and placental hormone have

all been advised for the purpose, but none are as yet established.

Excessive Secretion (Polygalactia).—This is very common. It is usual during the first week, and unless excessive, requires no treatment at this time other than massage after nursing, to get rid of the excess. If the excess persists the treatment is: (1) Massage after nursing; (2) hydragogue cathartics (magnesium sulphate; magnesium citrate) in sufficient amounts to give two liquid movements a day; (3) breast binder (Murphy) constantly; (4) scanty diet and especially diminution of fluid elements in diet; (5) regular nursing.

Hyperlactation is a voluntary prolongation of the period of lactation, the normal length of the period being eight to nine months. It is much more common in the poorer classes. The effect is bad for both; the mother becomes weak and anemic, thin, has pain in the breasts and back, and is generally neurasthenic. The uterus becomes much superinvoluted (lactation atrophy), and if the conditions are not corrected the atrophy becomes to a great extent permanent. Tuberculosis is likely to become active. The effect on the child is malnutrition, delayed dentition and rickets.

Treatment is to wean the child and prescribe full diet, rest, iron tonics and outdoor life for the mother.

Galactorrhea is a constant flow of milk from the breasts, irrespective of nursing, persisting after the child is weaned. The cause is unknown, but neurosis plays a part. The flow is usually moderate (few ounces a day) but may be as much as several quarts daily. The patient's health is not affected, as a rule, other than the natural annoyance of the condition, but she may show all the appearance of a serious wasting disease (tabes lactea).

Treatment is difficult. (1) Thorough massage of breasts; (2) constant tight breast binder; (3) restriction of diet, especially fluids; (4) potassium iodid or potassium acetate gr. x four times a day; (5) hydragogue catharsis.

The breast binder should be disturbed as little as possible,

as constant compression is the most valuable factor. Strapping of the breasts with adhesive strips may be more effective. The condition resists treatment stubbornly.

Drying up milk after child's death is the same as the treatment for galactorrhea. Here the binder must be disturbed as little as possible, as massage tends to keep up the secretion. Usually in forty-eight hours most of the discomfort is past.

Galactocele is a cyst, filled with milk, due to the occlusion of a milk-duct. It is usually small and of no importance, but if large and painful, it should be drained with a hypodermic syringe, and the area compressed by a pad and adhesive straps, to prevent refilling of the cavity.

Qualitative Anomalies of the Milk.—A meat diet increases the fat and casein, but decreases the sugar. A vegetable diet increases the sugar, but diminishes the casein and fat. The commonest anomaly is deficiency of fat and excess of casein, a condition difficult to remedy by diet.

Profound emotion, anger, fright, all affect the milk unfavorably. Some germs, notably those of tuberculosis, pass through the milk. Yellow milk is usually due to a failure of emulsification of the fats; blue, red and green milk are the result of bacterial activity.

Abscess of the areola is due to infection of Montgomery's glands. It is treated like any other small boil, by opening and drainage.

Engorgement of the Breast.—The engorgement may be general or local (caked breast). Engorgement is the rule when the milk first appears. At other times the commonest cause is cold.

Symptoms.—(1) Sudden fever (the commonest cause of a sudden rise of temperature during lactation is engorgement of the breasts); (2) breasts are heavy, tense, hot and tender; (3) engorged lacteals can be palpated.

Treatment.—(1) Hydragogue catharsis; (2) massage, preferably catching the milk in sterile gauze and not in a breast pump; (3) breast binder; (4) cold, by means of two ice-bags to each

breast constantly or (5) heat by hot cloths for twenty minutes in every two hours. Cold is the more efficient. It may be applied by the Leiter coiled rubber tube, with ice-water flowing through it. The apparatus needs constant watching, as air-locks tend to form, and stop the flow of water, and is not as efficient as ice bags.

A local engorgement with induration but without suppuration is called "caked breast." Massage is a mistake, as it is often a forerunner of a breast abscess. The best treatment is to apply bags, but otherwise to leave the breast alone.

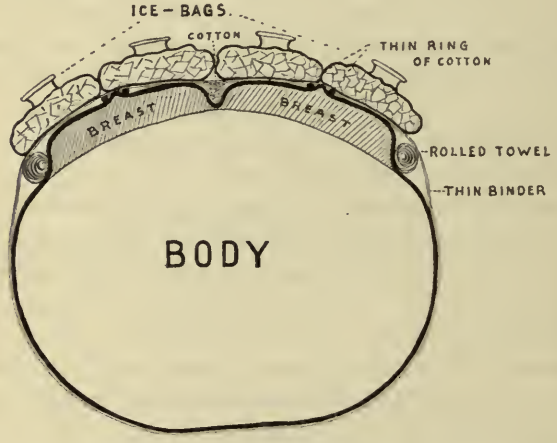


FIG. 174.—Schematic section of body, showing relation of ice-bags to breasts. (*De Lee.*)

Technic of Massage.—Above all, massage must *be gentle.* It cannot be hurried; at least twenty minutes being required to empty the breast. The operator's hands must be thoroughly scrubbed and liberally anointed with sterile oil. The skin of the breast must be thoroughly cleansed. There are four series of movements: (1) Gentle circular movement from the periphery toward the nipple; (2) breast supported and inner segment massaged toward nipple; (3) same reversed for outer segment; (4) bimanual rotary compression, from periphery to

nipple. The milk should be caught in sterile gauze, as it comes from the nipple. Breast pump should not be used. All movements must be gentle, and the force gradually increased only as the breast softens. The massage should never be painful; bruising of the breast is a prolific cause of a breast abscess.

Mastitis (Breast Abscess).—Inflammation of the breast may occur in the areola, the subcutaneous connective tissue, the gland itself and the connective tissue under the breast. The commonest type is infection of the gland, with secondary involvement of the connective tissue. The bacteria responsible are usually Staphylococcus albus or aureus, Streptococcus pyogenes, pneumococcus, colon bacillus or Oïdium albicans.

Cause.—Dirt in handling, whether from hands, cloths, water, clothes or various applications, is the chief cause. The widespread superstition among the poor that saliva is the best application for a fissured nipple is responsible for many cases. The skin of the areola and nipple always contains pathogenic germs, and these may develop powers of invasion, through the ducts (this will explain the cases due to bruising in massage). The child may be the source of infection, if it has thrush or stomatitis.

Symptoms.—A chill and moderate of fever (103°) most commonly from the tenth to twentieth day of the puerperium. The breast is painful, and one or more indurated areas can be felt. The commonest portion affected is the outer lower quadrant. The temperature and pain usually subside within thirty-six hours; if they continue, suppuration is to be expected.

Treatment.—(1) If the breast is engorged, massage is indicated, otherwise not. In any case it must be gentle; (2) purgation with hydragogue cathartics; (3) breast binder; (4) ice-bag over affected area; (5) applications of saturated magnesium sulphate solution or dilute leadwater and alcohol (two ounces leadwater to three ounces of alcohol); (6) strapping with adhesive straps, if the extra pressure is not too painful.

This treatment is to be used only *before* suppuration is evident, and is often spoken as the "abortive treatment." Bier's local hyperemia, by suction caps, is painful and ineffectual. It is used with suction for four minute periods, with equal periods of rest, for forty-five minutes once daily. The results do not justify its use.

Breast abscess is a common sequel of mastitis. As the area involved in the suppurative process is, at first, small, but tends

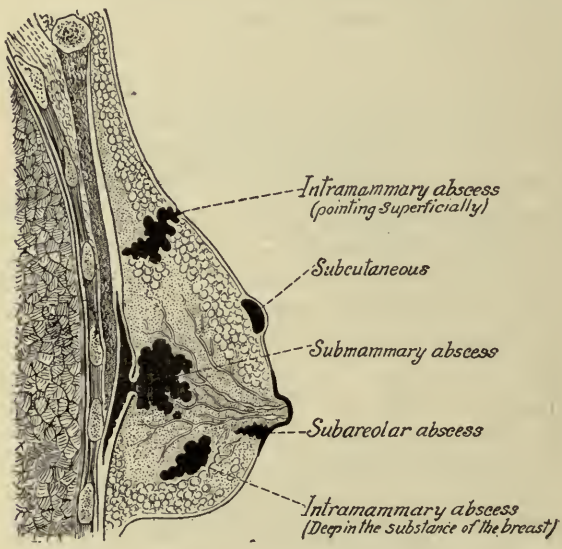


FIG. 175.—Location of pus in a breast abscess. (*After Deaver.*)

rapidly to infiltrate the entire breast, it is important to recognize the presence of pus as soon as possible. A breast abscess is nearly always multilocular and fluctuation is *not* to be awaited. The pus is located above, usually in, or under the gland.

Symptoms at first are indefinite. Pus may be expected with the following signs: (1) A dusky red or purple color of the skin over the indurated area; (2) edema of the skin over the

indurated area; (3) fever of an irregular septic type; (4) leukocytosis (18000 to 22000 on the average).

Differential diagnosis may be needed, in rare instances, from carcinoma of the breast, tuberculosis of the breast or actinomycosis. There is a type of carcinoma of rapid growth, first appearing in late pregnancy or early puerperium, called *mastitis carcinosa*. This, as well as tuberculosis or actinomy-

FIG. 176.—Drainage required in a case of mammary abscess. (*B. C. Hirst.*)

cosis, requires microscopic sections of an excised portion, for accurate diagnosis.

Treatment.—Early opening of a breast abscess is imperative, before wide destruction of the gland has taken place. The technic is as follows: (1) General anesthesia; (2) local surface cleansing as for any operation; (3) with a thin-bladed

knife, make multiple stab wounds, about one quarter inch long, opening every area where pus is suspected, and wiping off blade of the knife with alcohol pad, after each incision. These incisions are to be made radiating from the nipple, so as not to cut across a milk-duct; they should be entirely within or without the areola, and not across the border (as in healing the pigment will follow the scar); the incisions should be so planned that when the patient is out of bed, all drainage tubes will run down hill, and not straight across the breast; and it is desirable to confine all incisions, if possible, to the lower half of the breast; (4) a long hemostat is inserted through each opening, and the septa between the locules of pus broken down, so as to make as nearly as possible a unilocular abscess; (5) each opening is flushed out with sterile water, run from a fountain syringe by gravity; (6) each pair of openings is then connected by fenestrated rubber drainage tubing, about the size of a lead pencil. The tubing is pulled from one opening to the other by the hemostat or clamp. Care is taken not to run the tubes superficially (as they will slough out and make ugly scars) or under the nipple; (7) safety pins are passed through each end of each tube; (8) the tubes are flushed with sterile water, to be sure they are patent; (9) the breast is dressed with bunched gauze and a breast binder. Bandages or straps are a nuisance.

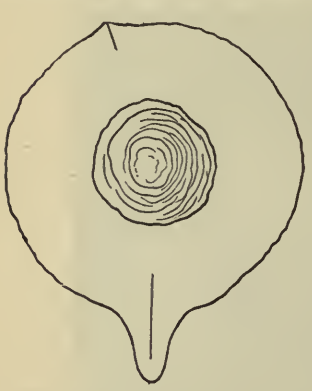


FIG. 177.—Pigment of the areola following incisions. (*Richmondson.*)

The *Bier hyperemia treatment* is a failure in the ordinary breast abscess. It is fairly effective in small single abscesses, but a much easier, quicker and less painful way to cure a small unilocular abscess is to make a single small incision over the most prominent part of the swelling, wash out the pus, and

inject a 2 per cent. solution of hegonon, or 5 per cent. silvol. If the systemic symptoms of a breast abscess are severe, and the pus is streptococcic, intravenous injection of 100 mils of antistreptococcic serum is often of great value.

The usual time of healing of a breast abscess, properly opened and drained, is five to six weeks.

After-treatment.—The drainage tubes are flushed, once daily, with sterile water, run by gravity from a fountain syringe with a medicine dropper attached to the tube. Only if the tubes are blocked is a piston syringe used to force water through them, and as soon as they are clear, the fountain syringe is substituted. No attempt is made to remove the tubes for at least two weeks, and then the shortest is removed first, and the others at two- or three-day intervals; the sinuses are packed *lightly* with gauze, from each end, and flushed daily. Small secondary superficial collections frequently need opening during the convalescence. Unless the nipple ducts have been blocked, lactation in subsequent confinements is surprisingly little interfered with.

Postmammary abscess (submammary abscess) is a collection of pus in the connective tissue under the breast, just over the pectoral muscles. It is rare, and serious.

Symptoms.—One breast is more prominent than the other, the whole gland being lifted off the chest. There are no symptoms of inflammation in the breast itself, and very little pain on pressure. Systemic symptoms of sepsis are severe, fever high and leukocytosis 25,000 or more.

Diagnosis is best made by aspiration with a hypodermic syringe. The needle should be of fairly large caliber, as the pus is usually thick.

Treatment.—An opening is made at the most dependent portion, a counter opening diametrically opposite, and through-and-through drainage established by a fenestrated rubber tube. The aftercare is that of ordinary breast abscess.

Tumors of the breast usually adenomata, often grow rapidly in pregnancy, and in lactation become so engorged and painful

that their removal is often demanded. They should, however, be let alone, if the symptoms are not such as to make their removal imperative. When removed, they should always be examined microscopically.

If malignant, tubercular, or actinomycotic, the whole breast must be removed.

CHAPTER XVII

PUERPERAL SEPSIS

Historical.—The cornerstone of antisepsis in obstetrics was laid by Semmelweis, in the maternity department of the Vienna General Hospital, in 1846–7. By compelling the students in attendance to wash their hands in chlorin water before making any vaginal examination, the death rate sank from 11.4 per cent. in 1846 to 1.25 per cent. in 1848.

Cause.—The genital canal of the infant at birth is normally sterile. The genital canal of a healthy adult is sterile above the internal os. The patient is protected from infection by: (1) The acid vaginal secretion (due to lactic acid, secreted by Döderlein's bacillus); (2) leukocytosis and phagocytosis; (3) the mucous plug in the cervix; (4) during and after labor the additional safeguards of the descent of the liquor amnii, the child's body and the lochia; (5) the diminished virulence of any pathogenic bacteria resident in the vagina.

Microörganisms are easily introduced from the vulvar and perineal skin, by vaginal examination, or by unclean hands or instruments. No pathogenic germs are found in normal vaginal secretions; in abnormal secretions, occurring in 33 to 40 per cent. of patients, staphylococci, streptococci, colon bacilli, gonococci and many other varieties appear.

Routine douching of the vagina is not to be depended on as a prophylactic measure, as it destroys the natural safeguard of acid secretion, and does not destroy the pathogenic germs.

Kinds of Sepsis.—(1) *Septicemia* (streptococcic infection) due to the absorption of bacterial toxins, or the actual invasion of pyogenic organisms into the blood current; (2) *sapremia*, due to the absorption of toxins from putrid material retained

in the uterus. Sapremia is the least serious, and easiest cured. Pyemia is another name for streptococcic blood infection.

Bacteria at Fault in Septicemia.—Any pathogenic germ is capable, theoretically at least, of causing puerperal sepsis. The commonest are: (1) Streptococcus pyogenes, in about 94 per cent.; (2) staphylococcus of some form, usually albus or aureus; (3) colon bacilli; (4) gonococci (usually associated with streptococci or staphylococci). It is rare to find, in cultures, a single strain. Usually the cases are mixed infections, as many as fifteen different bacteria being found in a single case. Streptococci are usually hemolytic, as may be also many others, even the colon bacillus.

Method of Introduction into the Genital Tract.—(1) Hands of physician or midwife—by far the commonest mode; (2) much more rarely the nurse; (3) dirty instruments; (4) water; (5) pads; (6) clothing; (7) bed clothing; (8) bath water—hence tub baths should be replaced by showers, in hospitals at least; (9) auto-infection—when the pathogenic germs are already resident, and increase in virulence after labor. This undoubtedly occurs, but infrequently, and should not be assumed until all other modes have been excluded. The possibility of sepsis from dust-laden air cannot be forgotten. Many cases have been reported in which this cause was apparently proved.

How Bacteria Behave.—(1) Döderlein's bacillus is destroyed and the vaginal secretion becomes alkaline; (2) the pathogenic germs tend to spread up the genital canal; (3) a trail of false membrane is left behind, covering every wound or abrasion in the genital tract; (4) mixed infections are usually more serious; (5) most germs tend to spread through the uterine and broad ligament lymphatics to the peritoneum (except the gonococcus and colon bacillus, which show preference for the uterine and tubal mucosa); (6) the higher up in the genital canal the starting point of infection, the less is the patient's resistance. Saprophytes usually attack the hypertrophied decidua, which is peculiarly putrescible.

Symptoms and Diagnosis.—*General symptoms* are: (1) A rise of temperature, usually taking several days to reach its maximum, and preceded often by a chill. Rarely the temperature rises abruptly; (2) increased pulse; (3) anorexia, heavy breath and coated tongue; (4) in the worst cases a septic diarrhea and erythematous blotching of the skin. In any case where temperature and pulse are elevated, and no other cause can be found, puerperal sepsis should be suspected.

Local symptoms are: (1) Foul discharge. This is not constant. A very foul discharge without any evidence of infection may be due to decomposition of lochia in the upper part of the vagina; the worst cases of hemolytic streptococcic infection often have no discharge at all; (2) redness and edema of the labia; (3) false membrane over the normal mucosa or any abrasion; (4) cessation or diminution of the lochia; (5) subinvolution of the uterus; (6) later the development of inflammatory exudate in the bases of the broad ligaments.

Differential diagnosis from other adynamic diseases is made: (1) From malaria by the finding of the protozoa in the blood; (2) from typhoid fever, by the Widal reaction, although a positive Widal is sometimes seen in streptococcic infection; (3) bronchopneumonia is a not uncommon complication of the puerperium, and much like sepsis until the characteristic signs appear in the chest.

Blood Picture in Sepsis.—(1) Marked leukocytosis; (2) eosinophiles at first are absent, and their return a favorable sign; (3) high percentage of polymorphonuclear cells; (4) a reduction in the number of lobes in the polymorphonuclear cells (often spoken of as "the blood picture pushed toward the left").

A low leukocyte count, with grave systemic symptoms is an unfavorable sign.

Methods of Precision in Diagnosis.—(1) Leukocyte and blood count as above; (2) uterine cultures; (3) blood cultures.

Uterine cultures are best made with the Döderlein tube as modified by W. R. Nicholson. The cervix is exposed through

a bivalve speculum, the glass tube with its sheath is inserted past the internal os, the glass tube pushed out through the sheath into the uterine cavity. By suction with a piston syringe and rubber tube attached to the end of the glass tube, the latter is filled with the uterine discharge. The glass tube is withdrawn into the sheath, and the two withdrawn as one. The glass tube is sealed with sealing wax at both ends, and sent to the laboratory for culture. The method is unreliable, 75 per cent. at least of puerpera show a positive result, and in

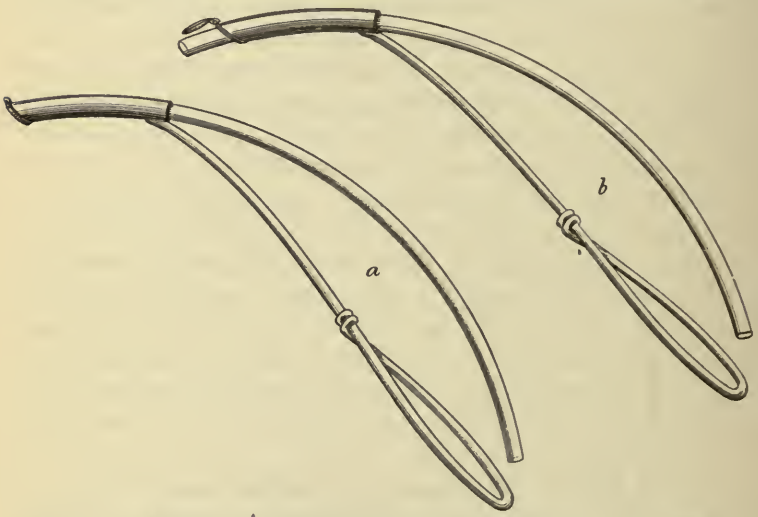


FIG. 178.—Nicholson's modification of the Döderlein tube. (*B. C. Hirst*).

many cases of streptococcic blood infection, the uterine culture may be negative.

Blood Cultures.—A spot on the skin over the median basilic vein is carefully sterilized and the vein made prominent by a tourniquet—10 to 20 mils of blood are withdrawn by a sterile glass hypodermic syringe, and cultured.

Strict aseptic technic and good laboratory technic are essential. Contamination shows in about one-third of the cases, but the method is more reliable than uterine cultures. The

virulence of streptococci is in direct ratio to their hemolytic power.

In any case of doubt it is wise to treat the case as one of sepsis, until the correct diagnosis can be established.

TREATMENT

Preventive Treatment.—(1) Room should be, if possible, sunny and well ventilated. A communicating bath room is a desirable feature, the old superstition as to sewer gas being thoroughly discredited—providing the plumbing is good and of the modern type. Unnecessary furniture and hangings should be taken out, and no food, unemptied bed-pan or commode should be left for any length of time.

The bed is protected by rubber sheeting, and extra pads of squares (1 yard square) of nursery cloth (boiled and dried) are provided. The mattress and bed-clothing should be fresh and clean.

Patient.—She is told to take a full bath (preferably shower) at the onset of labor, particular care being given to the genital region. The pubic hair is clipped close or shaved. Depilatory pastes (barium sulphid 1, starch 3) are unreliable and often intensely irritating. Should she have any abnormal vaginal discharge, the vagina is thoroughly cleansed by pledgets of cotton and tincture of green soap, followed by a douche of lysol solution (½ dram to 2 pints), followed by sterile water (the lysol, if any be retained in the vagina, being an irritant to the child's eyes). Otherwise douching is unnecessary, and often harmful. Care is taken to see that every portion of placenta and membranes is evacuated, in the third stage.

During the puerperium, the vulva and perineum are irrigated at least six times daily, to remove blood-clots and lochia.

Physician should wear an operating suit, gown and sterile gloves. His hands should be carefully scrubbed and the gloves sterilized just before each examination. If the gloves are boiled, they should be boiled flat, wrapped in a towel or gauze, and never rolled in a ball. Autoclave sterilized dry gloves are

preferable, but not always procurable. He should not attend contagious diseases and also obstetric cases.

Nurse is subject to the same general rules as the physician. Her hands should be clean, her uniform fresh, and she must wear sterile rubber gloves in catheterizing, douching, or caring for the patient's breasts.

Water should be boiled for at least half an hour before use, and no dependence should be placed in antiseptic solutions made with unboiled water.

Instruments are boiled for fifteen minutes before use. If injured by boiling, (like bougies) they are soaked for at least one hour in cold 1–500 bichlorid, or 1–10 carbolic acid, or 2 per cent. formalin solution. Bougies particularly, or any other implement that will float, must be wrapped in gauze before being immersed in the solution.

Vulvar pads are made of sterile cotton and gauze. The nurse each morning makes up, with sterile hands, the day's supply, which are then scrupulously protected from contamination, and removed from the wrapping as required. They are changed six times daily for the first week, then four times daily.

Cotton pledgets are made by cutting the rolled cotton into squares about six inches square. Pledgets used for cleansing the vulva are of course used but once, and always in the direction from vulva to anus.

Clothing worn by the patient should be absolutely clean and freshly laundered.

Antiseptic solutions in labor are likely to prove irritating to the child's eyes. The best of them is lysol (½ dram to 1 dram to the quart), the most dangerous, bichlorid of mercury. They should always be made with boiled water.

Vaginal examinations should be limited to as few as possible. The patient is arranged on her back or side, with suitable exposure of the vulva. She is carefully cleansed, and the examining finger, gloved and anointed with sterile lubricant, inserted by the sense of sight.

Rectal examinations have been advised, to limit risk of infection, and have met with considerable endorsement.

In any forceps operation, special care as to cleansing and as far as possible the avoidance of bruising must be employed. For podalic version, the arm should be covered by a sterile rubber glove and gauntlet. It is not possible to perform version with a short glove and long-sleeved gown.

Curative treatment may be *local* or *general*. The local curative treatment consists of a thorough disinfection of the genital tract by curet, placental forceps and douche. Technic: (1) No anesthetic is needed, but the procedure *must always* be done on a table, and never in bed. (2) The patient is placed in the lithotomy position, and her knees held by a sheet leg-holder (see chapter on operations in private houses). (3) The vulva and vagina are thoroughly scrubbed with cotton pledgets and tincture of green soap, and douched with lysol solution (1 dram to the quart). (4) The anterior lip of the cervix is caught with a double tenaculum. (5) The uterus is thoroughly explored with Emmet curettement forceps, and all loose material extracted. (6) The uterus is *gently* scraped with a broad dull curet, re-explored with placental forceps, until no more organized material is extracted. The curet is best confined to those cases where the uterus is thickly lined with necrotic decidua, which is difficult if not impossible to remove except by curettage. In all other cases, the placental forceps alone are sufficient. (7) The uterus is douched with lysol solution, and packed only if there is free bleeding. (8) The packing, if any, is removed in twenty-four hours and the uterus douched again. (9) One thorough cleansing with placental forceps is sufficient, subsequent treatment being daily douching, until the temperature has been normal for forty-eight hours.

Douche.—The best composition for an intra-uterine douche is one of the following: (1) Tincture of iodin 4 drams, alcohol (ethyl—95 per cent., *never* methyl or wood alcohol) 8 ounces, sterile water up to four pints; or (2) formalin (40 per cent.)

30 drops, glycerin 2 ounces, water 1 pint; or (3) lysol solution 1 dram to 2 pints. The temperature of the douche should be 110°–115° F. The patient is placed in the dorsal position, cleansed, the cervix exposed through a bivalve speculum, the intra-uterine catheter (best the *large* Bozemann) inserted by sight, and the solution allowed to flow by gravity, with not more than two feet head. The douche bag or can and catheter are boiled and the solutions made up with sterile water. One intra-uterine douche a day is enough.

Contra-indication to disinfection of the genital canal is phlebitis. If it could be known that the patient had phlebitis and that the uterus was empty, no cleansing would be needed. But as this diagnosis is made only by exclusion, one disinfection is permissible. If the fever rises sharply, however, after the cleansing, no further intra-uterine treatment of any kind should be given.

Objections are: (1) Danger of carrying infection into the cervical muscle, by the tenaculum—negligible; (2) danger of breaking down the protective wall of leukocytes under the decidua and favoring the spread of infection—negligible if proper gentleness is used; (3) danger of perforation of the uterus—undeniable, but small if proper skill be used, and the operation done on a table and *not on the bed*. Also the method should be much more gentle than the curettage of the non-pregnant uterus.

Perforation of the uterus is a dangerous accident, in a septic uterus. If the curet suddenly slips in much further than usual, and no resistance can be felt, all further attempt should be abandoned. Above all, do not douche. The safest plan is to open the posterior vaginal vault, pack with gauze and put patient in the Fowler position. Hysterectomy is not required.

General Treatment.—(1) *Diet* is chiefly concentrated liquids, milk, broth, soups, and alcohol up to the point of tolerance.

(2) *Drugs* are chiefly heart stimulants. As long as the pulse is under 110, none are needed. Digipuratum 1 ampule t.i.d.

or digalen ℳ.x.t.i.d., or digitalin gr. $\frac{1}{50}$ t.i.d., all hypodermically—or tincture of digitalis ℳ.x.t.i.d. by mouth; strychnin sulphate gr. $\frac{1}{20}$ hypodermically t.i.d. In emergencies, caffein, sodium benzoate, camphorated oil, nitroglycerin and oxygen.

Artificial hyperleucocytosis is, theoretically at least, advisable. (1) Protonuclein gr. v four times daily by mouth is of very doubtful value; (2) hypodermic injection of two drams of a 2 per cent. watery solution of nuclein twice daily; (3) a *fixation abscess* by hypodermic injection of one dram of turpentine under the skin of the abdominal wall; (4) sodium nucleinate injections, twice daily.

Serum therapy is often brilliantly successful and always, even in apparently unfavorable cases, worth a trial. Like any other serum it must be given early, and in sufficient doses. Much the best method of administration is intravenous, 150 to 250 mils of antistreptococcic serum at a dose, repeated once daily for a total of 500 to 750 mils. An alternative method is to give the serum in doses of 80 to 100 mils into the areolar tissue under the breasts, repeated three times daily, but this is not nearly so efficient as intravenous administration. The serum must be fresh; it will not stand distant transportation, and, in the proper doses, is expensive.

If antistreptococcic serum is not available, or is inefficient, five to seven ounces of normal human blood-serum may be given intravenously, once daily, but this is still largely experimental.

Bacterins are much less efficient than serum. Autogenous vaccines are better than stock, and should be given in huge doses, 1000 to 2000 million. Streptococcic infection is least amenable to vaccines; gonorrheal infection, especially arthritis, is often favorably influenced.

Salt solution is better given by slow infusion into the rectum than by either hypodermoclysis or intravenous. Thirty to forty drops to the minute are instilled. If the rectum becomes intolerant, the injection is stopped and continued only intermittently, with intervals of several hours.

Transfusion of blood may be of use in the hemolytic streptococcic infections. It is not required in other forms, but is still experimental, though devoid of harm.

Colloidal silver, injected intravenously, as 3 to 5 mils of 2 per cent. collargol or argyrol daily for three to four days has been tried extensively. It is not free from danger, and is of questionable value.

Operative Treatment of Puerperal Sepsis by Abdominal Section.—*Indications* for abdominal section are: (1) Localized suppurative peritonitis; (2) diffused suppurative peritonitis; (3) suppurative salpingitis or oöphoritis; (4) suppurative metritis, when pointing toward the peritoneal cavity (cornual abscess most commonly); (5) suppurative cellulitis, (largely exploratory); (6) infected abdominal tumors.

Abdominal section is indicated when, in the course of septic fever, there appears a palpable abdominal mass; provided this mass is not in the base of the broad ligaments, in which case 90 per cent. undergo spontaneous resolution.

The mass is most likely to be a cornual abscess, with the adherent intestine and omentum.

Contra-indications are: (1) Sapremia; (2) phlebitis; (3) septic endometritis; (4) lymphangitis; (5) pyemia.

Exploratory section is done only to determine whether a mass, presumably containing pus, is intraperitoneal or extraperitoneal.

Hysterectomy, partial or complete, is often indicated. The need for it is not seen until the abdomen is opened. Indications are: (1) Ruptured uterus; (2) suppurative metritis; (3) gangrenous fibroids; (4) widespread infection of uterus and broad ligaments.

Special Technic.—Abdominal sections for sepsis differ from the ordinary sections in the following points: (1) Rapidity of operation; (2) only sufficient ligatures are used to stop the bleeding; (3) the broad ligaments are allowed to gape and are not sewed over; (4) vessels are tied separately, as much as possible; (5) the upper abdominal cavity is protected by gauze sponges; (6) practically every case is drained.

Drainage.—(1) Just before the abdomen is closed the pelvis is sponged as clean as possible; (2) a curved glass drainage tube about the size of the forefinger is put in the bottom of Douglas' pouch. The curved is better than the straight tube, because it can be brought out nearer the symphysis, and hence lessens the danger of incisional hernia; (3) under and around the tube is packed a gauze strip, usually four layers one and one-half inches wide (made by folding a six-inch bandage), so that the entire pelvis is filled and all the intestines held above the pelvic

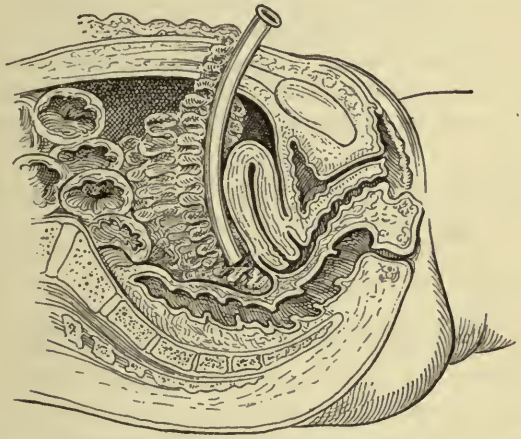


FIG. 179.—Abdominal drainage by glass tube and gauze; the most efficient type of drainage in septic conditions in the pelvis.

brim. The end of the gauze is brought out along the tube; (4) the protective sponges are now removed and the abdomen closed around the tube and gauze.

The vaginal method of drainage (through a tube in Douglas pouch) is not safe, in septic cases, and should be avoided.

After-care.—(1) Every twenty-four hours the glass tube is sucked out by a piston syringe and catheter, for the first five days. The amount of fluid will diminish from about an ounce the first day to a couple of drams on the fifth; (2) the patient is kept in the Fowler position and the Murphy drip (glucose one

and a half ounces, sodium bicarbonate one and one-half ounces, water two pints, forty drops a minute, temperature kept near 110°) is used; (3) all these patients need rather active stimulation, particularly in the second twenty-four hours; (4) on the fifth day the glass tube is removed; (5) beginning on the sixth day, the gauze is removed, taking out about one quarter of the total amount each day, so that by the tenth or eleventh day, it is all out; (6) as soon as the last of the gauze is out, a rubber tube is inserted in the sinus left by the gauze as deep as it will go, and a safety-pin put through the outer end; (7) through this tube the pelvis is flushed daily with sterile water, run in by gravity, and the tube shortened as it is pushed out from below; (8) the usual convalescence lasts four to six weeks. Except for these points, the after-care is that of the ordinary section.

Resection of the pelvic veins in sepsis is, as a rule, not justifiable. The mortality of the operation has been, in various reported series of cases, 49 to 84 per cent. Much better results can be obtained by other means.

COMPLICATIONS OF PUERPERAL SEPSIS

Endocolpitis or inflammation of the vagina, is shown usually by a thick gray-green false membrane. The best treatment is four hot vaginal douches daily, of sterile water. The routine use of antiseptic solutions is not to be depended on, as they diminish the resistance of the body cells, and do not destroy the micro-organisms.

Endometritis has the same necrotic membrane, but due to necrotic decidua. Under it is the protective layer of leukocytes which, if thick enough, confines the process to the uterine cavity. *Treatment* is daily intra-uterine douches of sterile water. One douche daily is sufficient.

Salpingitis and Oöphoritis.—An ovarian abscess is more common than salpingitis, and also much more virulent. The *septic* tube differs from the *gonorrheal* in that it is unilateral, fever much higher, leukocytosis higher, broad ligaments thick,

abdominal end of tube open. A primary pyosalpinx in the puerperium is rare. It is not uncommon for a pus tube that antedates pregnancy to be the seat of a fresh outbreak in the puerperium. Due to the large uterus, it is not always possible to feel a mass by vaginal examination, as the tubes are higher up, beyond the reach of the examining fingers.

Treatment.—Operation should be delayed, if possible, to allow of localization. By liquid diet, moderate purgation, ice-bag to lower abdomen constantly, and four hot sterile water vaginal douches a day, it is often possible to check the acute stage. A gonorrheal tube is much more likely to be favorably influenced than a septic, and particularly a primary septic, one. If there is no improvement in forty-eight hours, it is usually unwise to delay operation.

Metritis.—Infection may spread into the uterine muscle from the endometrium, and involve small areas only, or almost the entire muscular layer. When the infection reaches the peritoneum it causes firm adhesions of the uterus to any neighboring structures (the colon, small bowel, or omentum). The course is slow, but suppuration is the rule, and unless the abscess drains spontaneously into the uterine cavity, fatal peritonitis is to be expected.

Diagnosis is difficult. The uterus is fixed, enlarged, tender and often irregular, but unless an abscess breaks into the uterine cavity during the examination, the only way to establish the diagnosis with certainty is by exploratory section. There is often a palpable abdominal mass, which is not the abscess, but the adherent bowel and omentum, and this adhesion may occur without suppuration.

Treatment.—Ice-bag to the lower abdomen; four hot vaginal douches daily, and moderate stimulation. The abscess sometimes drains into the uterine cavity and spontaneous recovery results. This is not to be expected, however, when there is a palpable abdominal mass, as the pus, if any be present, is then under the peritoneal coat of the uterus or even outside the uterus, walled off by the adhesions. These cases demand

abdominal section, with complete or partial hysterectomy. If the abscess is a single one, at the cornu, it is possible to open

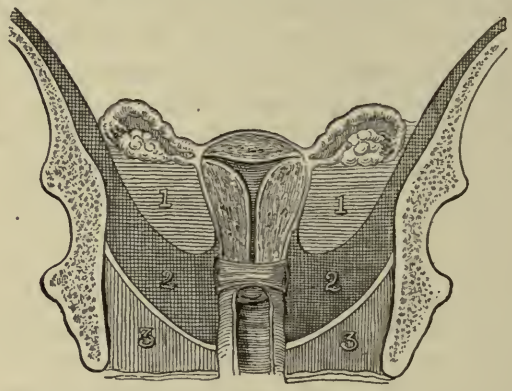


FIG. 180.—The areas involved in pelvic cellulitis. 1. Broad ligaments. 2. Base of broad ligaments and lateral vaginal fornices. 3. Ischiorectal fossæ.

and drain it, without sacrifice of any part of the uterus, but this is the exception.

Pelvic cellulitis is infection of the pelvic connective tissue of Douglas' pouch, the uterovesical space or the bases of the broad ligaments. The source of infection is through the lymphatics of the lower uterine segment and cervix, particularly if the cervix is torn. There is at first *edema* of the connective tissue, then *extensive cellular infiltration with absorption of the edema*, leaving the cellular elements as a stony, hard exudate. If there has not been much cellular proliferation, all induration may spontaneously disappear when the edema is absorbed, but this is not common.

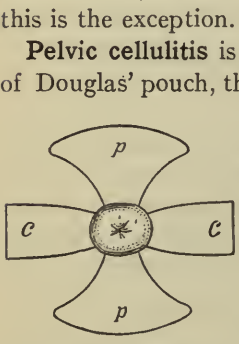


FIG. 181.—Diagram to illustrate the difference in indurated areas in peritonitis and cellulitis. Practically this is of little value, as the two are so often co-existent.

Theoretically the greatest induration in cellulitis should be laterally to the cervix, and in pelvic peritonitis anterior pos-

teriorly, but the two are so commonly associated that any attempts at differential diagnosis are futile.

Diagnosis.—The cervix feels as if fixed in plaster-of-Paris, and entirely immobile. The pelvis is filled by a stony exudate, and the cervix is pushed often far anteriorly or to one side. The exudate may be confined to the base of one broad ligament only.

Treatment.—In the stage of infiltration, before suppuration takes place, the treatment is palliative. As long as there is no bulging downward of the posterior or lateral vaginal

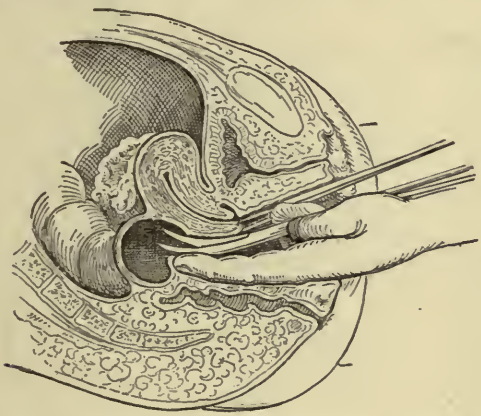


FIG. 182.—Opening a pelvic abscess through Douglas' pouch.

vaults, it may safely be assumed that there is no suppuration. (1) Hot vaginal douches of sterile water at 120° F., daily; (2) ice-bag or ice coil to lower abdomen constantly; (3) bowels open; (4) liquid or soft diet; (5) moderate stimulation. Tampons are painful to the patient, do no good in these acute infections and are therefore to be avoided.

Pelvic abscess occurs in about 10 per cent. of cases of cellulitis.

Symptoms.—(1) Fever of a septic type; (2) high leukocytosis (20,000–30,000); (3) bulging downward of the vaginal vault. The pus tends to burrow downward between the vagina and

rectum, and the posterior vaginal vault becomes convex instead of concave. The induration is too great for detection of fluctuation. Operation is indicated when the bulging of the vaginal vault appears.

Posterior Pelvic Puncture.—Technic.—(1) General anesthesia, careful vaginal scrubbing and patient in the dorsal position;

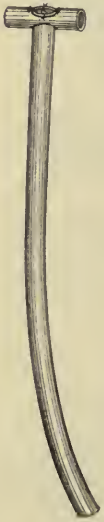


FIG. 183.

FIG. 184.

FIG. 183.—T-shaped rubber drain. It is important that the rubber tubing be of large caliber, to prevent occlusion by clots. The straight bar extends completely through the T arm, so that drainage is in a straight line. The function of the cross bar is solely to hold the tube in. (*B. C. Hirst.*)

FIG. 184.—T rubber drain seized in grip of dressing forceps preparatory to insertion through hole in vaginal vault. (*B. C. Hirst.*)

(2) catch posterior lip of the cervix with double tenaculum; (3) make a semicircular incision through the mucosa marking

the vaginal attachment to the cervix posteriorly; (4) long-handled, sharp-pointed scissors are plunged in through this incision, keeping strictly to the middle line and as close as possible to the uterus, and withdrawn open, to stretch the opening as far as possible; (5) it is usually wise further to dilate the opening with branched uterine dilators, to ensure free drainage; (6) the cavity is explored with the forefinger (scissors are not used because of danger of wounding the ureter, uterine arteries or intestine); (7) the cavity is flushed out with sterile water; (8) if evacuation of pus has been free, the cavity is drained

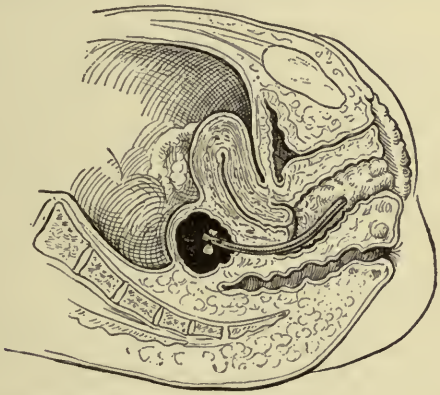


FIG. 185.—Drainage of a pelvic abscess, with a T rubber drainage tube.

with a T-tube—if not much pus but considerable cheesy exudate is found, the cavity is packed with gauze for forty-eight hours, to break down the exudate, and is then drained with a T-tube; (9) the T-tube is cut off flush with the vulvar orifice; (10) the pelvis is irrigated daily, with sterile water through the T-tube; (11) the tube is removed when the discharge has practically ceased, and the hole in the vaginal vault allowed to close, without packing.

Phlebitis.—The veins of the uterus and broad ligaments are infected from the placental site. The clots in the sinuses at the placental site are infected, the process extends to the veins

of the pampiniform plexus and the uterine and ovarian veins. The infected thrombus may extend into the iliac veins, a piece be broken off and carried to the lung. Peritonitis in phlebitis is very rare; pulmonary embolism and pyemia are not uncommon. The thrombotic process is not always confined to the pelvis, but may occur in remote areas—mesentery, lung or brain.

Symptoms.—(1) Long-continued septic symptoms, without signs of localization, point to phlebitis; (2) any attempt to disinfect or irrigate the uterus is followed by a sharp rise in temperature; (3) often, but not always, tenderness to palpation in the vaginal vaults; (4) involution of the uterus progresses normally. It is not uncommon for all symptoms to disappear, remain absent for several days and then return as severe as ever. These relapses may be many times repeated.

Dangers.—(1) Phlegmasia alba dolens (milk-leg) is almost sure to occur; (2) pyemia; (3) pulmonary embolus.

Treatment.—(1) Absolute rest in bed, until the temperature has been uninterruptedly normal for ten days; (2) stimulation, particularly alcohol, to the point of tolerance; (3) one disinfection of the uterine cavity, which will probably be followed by a temporary rise in temperature. The one cleansing is justifiable, to avoid leaving necrotic endometrium in the uterine cavity, but it should not be repeated, on account of the danger of embolism; (4) the operative treatment, by tying and excising, the ovarian, hypogastric or iliac veins, has given a mortality so much higher than the treatment outlined above, that it is unjustifiable.

Prognosis is guardedly favorable. There will be some mortality from pyemia and pulmonary embolism.

Pyemia.—*Symptoms.*—(1) Long-continued septic symptoms; (2) repeated chills; (3) positive blood cultures; (4) metastatic abscesses, but no pelvic localization.

Treatment.—(1) Forced concentrated liquid diet; (2) alcohol to point of tolerance; (3) digitalin gr. $\frac{1}{10}$ and strychnin sulphate gr. $\frac{1}{30}$ hypodermically four times daily as long as

pulse is over 110; (4) 250 mils of antistreptococcic serum *intravenously*, in one dose, and repeated in forty-eight hours if the symptoms justify it; (5) active stimulation—digipuratum 1 ampule hypodermically every three hours; strychnin sulphate gr. $\frac{1}{20}$ hypodermically; nitroglycerin gr. $\frac{1}{50}$ hypodermically; camphorated oil minims 30 hypodermically; oxygen and external heat, if sudden collapse occurs.

Prognosis.—Pyemia is always serious, causing most of the deaths from puerperal sepsis. The convalescence is very prolonged; metastatic abscesses may occur anywhere—in the joints, vital organs, even the eyeball. Meningitis is common and always fatal.

Phlegmasia alba dolens or **milk-leg** is a very common—almost a constant—sequel of phlebitis. The left leg is the more commonly affected—rarely the infection is bilateral. The name milk-leg comes from the milky white appearance of the skin or from the old belief that all localization of infection was due to metastasis of the milk—lactation being usually interrupted by the fever.

Kinds.—(1) Cellulitic, due to infection of the connective tissue of the thigh; (2) thrombosis of the iliac and deep femoral veins—much the more common (98 per cent.). The theory of venous stasis being the cause of phlegmasia is hardly tenable.

Symptoms.—(1) On the tenth to thirtieth day after delivery, the patient complains of severe pain in the calf of one leg, usually the left, and also in the corresponding groin; (2) the leg is almost immovable, and any movement gives intense pain; (3) the leg swells rapidly, the skin is tense and milk white, and usually pits deeply on pressure; (4) there is moderate fever, lasting for a short time, and subsiding long before the swelling shows any signs of decrease; (5) there is usually tenderness along the whole course of the femoral vein, which can be felt as a tender cord; (6) the swelling may begin in the groin and extend to the labium majus on the affected side; (7) the patient shows the usual signs of sepsis—depression, gastric disturbance, nausea and flushed cheeks.

In the cellulitic variety, the infection extends to the connective tissue of the thigh from the pelvic connective tissue, through the obturator foramina.

Treatment.—(1) Absolute rest in bed; (2) elevation of the leg, on pillows or in a fracture-box, at an angle of forty-five degrees. This does more to relieve the pain than any single point in the treatment; (3) evaporating lotions (leadwater two ounces, alcohol three ounces; or dilute leadwater and laudanum; or saturated solution of magnesium sulphate) covering the whole leg; (4) paint course of vein with 5 per cent. tincture of iodin or 50 per cent. ichthyol in glycerin—of doubtful value; (5) full diet and moderate stimulation; (6) no local massage; (7) The symptom urgently demanding relief is the pain in the groin. Ice-bag to the groin, more rarely a hot-water bottle, elevation of the leg and codein gr. ¼ or morphin sulphate gr. ⅙ hypodermically will give the greatest relief.

When the patient is out of bed, after the temperature has been normal for ten days, the swelling of the leg will often increase. This should be controlled by an elastic stocking, and no massage should be given for three months at least, and then very cautiously.

Dangers.—(1) Pulmonary embolus; (2) pyemia; (3) gangrene.

Prognosis is guardedly favorable. The patient must remain in bed until the temperature has been uninterruptedly normal for ten days, as the greatest danger is pulmonary embolus, from too early getting up. Recovery may be complete, but convalescence is usually prolonged, and a temporary or permanent lameness may result, about which the patient should be warned. Gangrene will demand prompt amputation, and is a very serious complication, as it is probably progressive. Extensive thromboses, even to the inferior vena cava, are not uncommon. In the cellulitic type, if long continued, elephantiasis is not unlikely, and suppuration is common. The most favorable termination is complete resolution, but is rarely attained. The next most favorable, and the commonest,

is organization of the thrombus, obliteration of the vein, and compensatory collateral circulation through the epigastric and gluteal veins, with frequent slight disability.

Pulmonary embolism is the greatest danger in phlegmasia. It is not likely to occur if the patient is kept quiet for a sufficient length of time. The clot may come from the femoral, iliac or uterine veins. A piece is broken off and carried by the circulation to the right auricle, right ventricle and pulmonary artery. Small emboli cause anemic infarcts and pleuropneumonia, and are not likely to be fatal, though a succession of them may be. The patient complains, without previous warning, of a severe pain in the chest and dyspnea. Her color is bad, she is obviously shocked, the heart is dilated and the pulse rapid, irregular and weak. If the embolus is a small one, active stimulation and oxygen will cause reaction in a short time. If the embolus is large the symptoms are all much more severe, and death is either instantaneous or so rapid that no time is given for any treatment.

Pelvic peritonitis is caused most often by an extension of septic endometritis, either through the uterine lymphatics or through the open ends of the fallopian tubes. Leakage from the tubes is the result usually of muscular exertion and while resulting peritonitis is sharp, it is usually of short duration, and may be due simply to the irritating nature of the fluid.

Symptoms.—(1) Moderate fever, usually considerably higher by rectum than by mouth; (2) great muscular resistance of the abdominal wall; (3) patient lies with knees drawn up; (4) peristalsis audible; (5) moderate leukocytosis; (6) pelvic exudate.

Treatment.—Both palliative and operative is that of cellulitis, with which it is usually associated. Pelvic peritonitis is more likely to require abdominal section than is cellulitis, but suppuration is less common.

Prognosis.—The majority recover with complete resolution of the exudate, without operation.

Diffuse peritonitis is the most fatal of all the complications of sepsis.

Causes.—(1) Extension from the pelvis; (2) rupture of an abscess in the uterine wall, usually at the cornu; (3) rupture or perforation of the uterus; (4) necrotic tumors.

Symptoms.—(1) Moderate fever, higher by rectum; (2) great muscular rigidity of abdominal walls; (3) peristalsis absent; (4) abdominal distention; (5) rapid, running, wiry pulse; (6) puckered anxious face, with gray pallor; (7) often, but not always, uncontrollable vomiting. All the local abdominal symptoms may be lacking, and a patient die within twenty-four hours of the onset of symptoms, from a fulminant peritonitis.

Treatment.—The only chance, though a very slight one, lies in early abdominal section; removal of the cause of the peritonitis, if it can be found; thorough flushing of the abdomen with salt solution; freest possible drainage, by rubber tubing through the abdomen, flanks and posterior vaginal vault. The operation must be rapidly done as the patient is a poor surgical risk. The intestines are found lightly glued together, are red and covered with yellowish-green lymph, and bathed in a thin pus. Localized abscesses between adherent coils of intestines are frequent and should be discovered and the coils separated. After the operation the patient is put in the Fowler position, with continuous enteroclysis, and very free stimulation.

Prognosis.—Almost all die within twenty-four to forty-eight hours. There is often a deceptive improvement shortly after operation, due to the temporary removal of the toxic fluid by drainage. Within twelve hours the patient sinks rapidly. Very rarely, a patient with diffuse streptococcic peritonitis will be saved, so the operation is always worth doing.

Sapremia is the form of sepsis, due to the absorption of the products of decomposition, from putrid pieces of placenta, membranes, blood-clot or decidua retained in the uterine cavity. It is, of all forms of sepsis, the easiest to cure. It

appears usually in the first three to five days of the puerperium, but may occur as late as the fourth week.

Symptoms.—(1) Elevation of pulse and temperature, without chill; (2) subinvolution of the uterus; (3) foul brown discharge; (4) blood culture sterile; (5) no symptoms of localization.

Treatment.—A thorough disinfection of the uterine cavity, as described under the local curative treatment of sepsis. The curet should be avoided as much as possible, though its gentle use will remove masses of decidua too flat and too tightly adherent to be removed by the placental forceps. Usually one disinfection is enough, and the symptoms promptly disappear.

Sudden cessation of the lochia is due to: (1) Very actively contracting uterus (only in primiparæ); (2) cervical canal obstructed by blood-clot or piece of placenta; (3) backward, rarely forward, flexion of the uterus (usually with sudden high fever—104° to 105°); (4) sepsis. The condition is a symptom only and is treated by removal of its cause.

Arthritis is seen only in pyemia or gonorrhea. It is always a serious complication. Pyemia attacks most often the knee and shoulder, though no joint is exempt; gonorrhea most often the ankles, wrists and fingers.

Pyemic arthritis should be opened and drained early, but the complication is usually fatal. Gonorrheal arthritis is treated as already described, by immobilization and vaccines, with a 20 per cent. risk of suppuration and ankylosis.

Septic proctitis is due to infected enema nozzles, and is treated by irrigation.

Septic cystitis and pyelitis is caused most often by dirty catheters. Infection may result from lymphatic or blood-current metastasis. A common predisposing cause to cystitis is prolonged pressure of the child's head in labor.

Symptoms of Cystitis.—(1) Several days after labor there develops frequent and painful urination; (2) vesical tenesmus; (3) moderate fever; (4) tenderness on palpation over the bladder; (5) cloudy foul urine, with ropy mucopurulent sediment.

Diagnosis may be confirmed by cystoscopy, when the blad-

der-wall is seen to be red, the vessels engorged and prominent, strings of mucopus hanging from the bladder-wall and possibly ulceration.

Treatment.—Prompt irrigation and disinfection of the bladder to prevent, if possible, an ascending ureteritis and pyelitis. (1) Rest in bed; (2) milk diet; (3) large amounts of water—fifteen to twenty glasses a day; (4) cystogen, or salol, or urotropin gr. x four times daily; (5) daily bladder irrigation with boric acid solution ten grains to the ounce, by a catheter and funnel; (6) injection, after the irrigation, with two ounces of 25 per cent. argyrol, or 25 per cent. protargol, 1 per cent. hegonon, or 10 % silvol soution, to be retained as long as possible.

Usually in three or four days all the acute symptoms have subsided.

Pyelitis may be suspected if: (1) Patient has a chill; (2) considerably higher fever; (3) pain in back and loin, referred along course of ureter; (4) leukocytosis of 20,000 or over. The diagnosis is established by cystoscopy, when the mouth of the ureter can be seen to be eroded, and urine full of pus may be obtained by ureteral catheterization.

Treatment.—(1) The affected ureter is catheterized, the catheter passed as high toward the kidney as possible, and the pelvis of the kidney irrigated with ten grains to the ounce boric acid solution, followed by 1 per cent. hegonon or 5 per cent. silvol solution. Unless a two-way ureteral catheter is used, dangerous pressure in the pelvis may be exerted, and the fluid must be injected very gently. Injection should cease at once if the patient complains of any increased pain in the back. The capacity of the kidney pelvis is 2 to 5 mils.

If the infection is not streptococcic, this treatment is followed by prompt improvement.

Streptococcic pyelitis is very serious, almost sure to require nephrotomy and drainage, and the majority are fatal.

Tetanus is rare in the puerperium. The commonest source of infection is dirty water used for douching. The symptoms

and treatment do not differ from tetanus in general, and the mortality is 90 per cent.

Ischiorectal abscess is an uncommon complication. It is due usually to infection from a deep tear of the vagina, or suppuration of a hematoma. The diagnosis is easy, the mass easily outlined by rectal examination, and free early incision and drainage are indicated..

CHAPTER XVIII

PATHOLOGY OF THE NEW-BORN INFANT

Asphyxia.—The causes of respiration in the new-born are: (1) Stimulation of all muscles, including those of respiration, to reflex action, by the sudden lowering of temperature from about 100° F. to room temperature at 70° F.;(2) accumulation of carbon dioxid in the blood, due to cessation of placental circulation, at first stimulates, but later paralyzes the respiratory ceaters.

Causes of Asphyxia.—(1) Prolonged pressure on the umbilical cord; (2) prolonged pressure on the head; (3) efforts at intrauterine respiration, usually dependent upon the first two mentioned; (4) traction on the neck, in breech deliveries; (5) accidents to or diseases of mother, such as hemorrhage, and toxemia; (6) congenital deformities of the child.

Kinds of Asphyxia.—(1) Asphyxia livida—the earlier and less serious; (2) asphyxia pallida.

Diagnosis is easy. The child is livid or pallid, depending upon the stage of asphyxia; the heart beats very slowly—60 or less per minute; no efforts at voluntary respiration are made.

Treatment is preventive and curative.

During labor any preventable cause of asphyxia should be removed. The heart sounds should be listened for at frequent intervals and if a progressive slowing takes place, forceps is usually indicated. At first there is a marked acceleration of the rate, but this is of short duration and the progressive slowing is the symptom most often observed.

Curative Treatment.—(1) Hold child upside down, by its feet, clean mucus out of mouth and throat by little finger, or better by aspiration of the mucus by suction through a

catheter with glass reservoir attached; (2) spank sharply. The child will begin to breathe sometime before it cries, and when respiration is established it should be let alone, and not mauled until it cries. The stages of recovery are: (1) Quickening of the heart rate; (2) gasping irregularly; (3) regular voluntary respirations; (4) crying.

FIG. 186.—Small lungmotor, designed for the infant. (*B. C. Hirst.*)

If prompt results are not attained, some form of artificial respiration should be used. Pouring ether on the child's chest or immersing it in cold and hot water alternately are both ineffective, and not worth wasting time over.

Methods of Artificial Respiration.—(1) Best of all is one of the mechanical devices, such as the lungmotor or pulmotor. This

latter should be set to work at the rate of the normal child's breating—45 to the minute.

(2) *Mouth-to-mouth insufflation*, where the child is placed on a table with its chest elevated. The face is covered with gauze, and the attendant blows gently through this gauze into the child's open mouth, and compresses its chest to expel the air. Also at the rate of 45 to the minute.

a *b*

FIG. 187.—Schultze's method of artificial respiration. *a*, First motion; *b*, second motion. (*From Cragin, "The Practice of Obstetrics."*)

(3) *Schultze* or *Swinging Method.*—The child is wrapped in a towel and held facing *away* from the physician. It is swung up over the left shoulder and then down again between the knees—calisthenics of doubtful value.

(4) *Marshall Hall Method.*—Rolling the child from side to side in a towel—doubtful.

(5) *Dew* or *Byrd* method, doubling up the body, holding upside down to allow mucus to run out of throat and straightening out again—reasonably efficient.

FIG. 188.—Dew's method of artificial respiration. (*From Cragin, "The Practice of Obstetrics."*)

(6) *Laborde Intermittent Tongue Traction.*—Inefficient.

(7) *Sylvester Method.*—Using the arms by traction, to inflate

the chest is not efficient, as the infant's pectoral muscles are too weak to elevate the chest wall.

(8) *Catheterization of the larynx* is advisable only when there is some obvious obstruction.

Any method used should be conducted gently and without violence, to avoid injury to the child.

If there is no response to efforts at resuscitation within half an hour, the case is hopeless. If the child responds, even slightly, efforts may have to be continued for hours.

Prognosis.—In asphyxia, the child will often die within forty-eight hours after resuscitation. The greater the difficulty in revival, the more likely it is to die. Inspiration pneumonia is a common and serious sequel. Intracranial hemorrhage is not uncommon.

After-treatment.—(1) Have child carefully watched for high temperature, rapid and feeble heart, rapid respiration and cyanosis; (2) keep child warm by hot water bottles; (3) give mustard bath three times daily for first three or four days; (4) give ½ drop tincture of digitalis, 5 drops of brandy in 1 dram of hot water every four hours, for the first four days.

Atelectasis is due to failure of the lungs to distend with air, due to some obstruction or malformation of the air passages. The child is born apparently in asphyxia pallida, is not revived, and the actual diagnosis made only by postmortem. There is no treatment.

Chafing of the skin, particularly of the buttocks, is very common. Treatment is: (1) Cleanliness; (2) avoid soap and water and use only olive oil; (3) powder with talcum after oil is dried as much as possible; (4) frequent changing of diapers.

Acne is very common, occurs all over the body, and is treated in the same way.

Colic is seen in nearly every baby, at some time. It always indicates attention to the diet, and is due, most commonly, to an excess of proteid or fat in the milk. It may be caused

by the child nursing too fast at first. If so, giving ½ ounce of water just before nursing will be of benefit.

Temporary Relief.—(1) Enema of two ounces of soapy water, given with a soft rubber ear syringe, with soft rubber nozzle; (2) five drops of brandy in 1 dram of hot water; (3) pepsin gr. i in 1 dram of hot water; (4) hot peppermint water 1 dram.

Constipation in babies is often mechanical only, due to the persistence of the rectal valves, the sharp angulation of the sigmoid, the tight sphincter and the weak abdominal muscles. If the movements when passed, are soft and well digested, the constipation is mechanical and best relieved by the use of the soap stick, and not enema, as the latter forms a habit.

When movements are formed and hard, more fat is needed in the child's diet. This may be secured by (1) olive oil (½ dram twice daily by mouth), or oil rubs or, in bottle fed babies, by a change in the formula. Moderate constipation is often relieved by milk of magnesia, 20 drops three or four times a day, but for immediate results, particularly if the movements are green, castor and sweet oil, each 30 drops, are best.

Diarrhea.—Four to six movements a day are not necessarily abnormal. Severe diarrhea is due to errors in diet or milk infection.

Treatment.—(1) Castor oil 1 dram, not repeated inside of forty-eight hours; (2) colonic irrigation, if movements are irritating; (3) bismuth subnitrate gr. ii, precipitated chalk gr. v four times daily, given in suspension in water, with a medicine dropper.

Congenital Deformities.—(1) *Harelip.*—May be repaired in the first few days of life.

(2) *Tongue-tie.*—Interferes with nursing. The child is made to cry, in a good light. The frenum is snipped with blunt pointed scissors and with the finger torn down to the base of the tongue.

(3) *Cleft-palate.*—The child can only nurse from a bottle with a flap of rubber over the nipple, to form a temporary,

artificial roof to its mouth. Operation should be postponed for several years at least.

(4) *Polydactylism.*—Extra fingers and toes are ligated with fine silk and amputated, unless they are obviously firmly attached. Usually they are only bits of flesh.

(5) *Umbilical hernia* is best treated by a convex button held in the ring by adhesive straps, or by adhesive straps pinching the abdominal wall tightly enough to close the ring. Several months' treatment is necessary.

FIG. 189.—Nipple with rubber flap, to be used in cases of cleft palate. (*De Lee.*)

In severe cases, where a large section of the abdominal wall is lacking, and the intestines covered only by peritoneum (exomphalos; celosoma) operation is necessary, but the prognosis is bad.

(6) *Spina bifida* is seen most often complicated by hydrocephalus. The defect should be closed by excision of the sac and interrupted catgut sutures. If hydrocephalus develops, the spinal canal can be drained by a canula through the body of the last lumbar vertebra, into the postperitoneal space.

(7) *Phimosis.*—Every male baby has a tight, adherent prepuce. It is best stretched with small hooks (strabismus hooks) about the tenth day; the adhesions broken up, the glans oiled and prepuce brought back over it. Daily thereafter the skin is retracted, and for the first week the glans is oiled, to prevent the recurrence of adhesions. Circumcision is not necessary, if the prepuce can be retracted.

(8) *Paraphimosis* is rare, except with hypospadias. When it occurs, without hypospadias, the tight ring must be cut.

(9) *Imperforate rectum* is the most serious of all the deformities. A crucial incision is made over the site of the anus, by blunt dissection the pouch of rectum is reached, pulled down,

opened and sewed to the skin. The prognosis in these cases is good. If the rectum cannot be reached through the perineum, an inguinal colostomy is required, and in these cases the prognosis is bad.

(10) *Club-foot.*—Every baby can lie with its legs fully extended and clap the soles of its feet together. This must not be mistaken for club-foot. If the foot is really clubbed, some benefit can be gained by plaster cast, until proper orthopedic measures can be instituted.

Convulsions may occur as a result of: (1) cerebral injury in labor; (2) gastro-intestinal irritation; (3) constipation; (4) without demonstrable cause.

The *treatment* is: (1) one dram castor oil; (2) colonic irrigation with cool salt solution; (3) mustard bath (technic described under inspiration pneumonia); (4) stop food for two or three feedings; (5) remove cause of convulsions, if any can be found.

Hemophilia of the new-born shows itself most often as **melena** (intestinal bleeding). Hemophilia is said to be transmitted through the female (who does not show it) to the male (who does not transmit it). It is most common in premature children, but may occur in those born at full term. The child may bleed from any portion of the body, but most often the blood is found in the stools. Care should be taken to see that the blood passed is not swallowed by nursing from a fissured nipple.

Treatment.—In true melena styptics are of no value. 10 to 20 mils of normal horse serum should be injected daily, until the bleeding ceases. Any kind of serum, or even whole human blood may be injected. If human blood is used, it should not be that of the parents. Injections of gelatin are dangerous, because of the danger of tetanus and anthrax. Transfusion is effectual, but no better than serum or whole blood injections, and much more difficult to do.

Icterus neonatorum (jaundice) is of two kinds: (1) *Hepatogenous*, which is common in all children, due to failure of

drainage of bile from the very small common duct. The pigmentation disappears in a few days. Treatment is calomel gr. $\frac{1}{20}$ every $\frac{1}{2}$ hour for ten doses followed by 30 drops each of castor and sweet oil. Treatment does not hasten the disappearance of the jaundice, and is really unnecessary.

It is now thought that the jaundice has nothing to do with the liver, but is due to the breaking down of large numbers of red blood corpuscles soon after birth and therefore is hematogenous. This theory has not yet been proved. In any case, the ordinary jaundice of the new-born is not serious, and need cause no concern.

(2) *Hematogenous* (Buhl's or Winckel's disease) due to a blood-current infection with hemolytic streptococci, and acute yellow atrophy of the liver. It is always rapidly fatal. The difference is obvious. In the first the child may be deeply pigmented, but shows no evidence of illness. In the second the child is gravely ill, with great prostration and high fever.

Injuries of the New-born.—*Fractures* of the skull are nearly always the result of forceps deliveries. They are most common in the occipital bone, and next in the parietals, depending upon the position of the forceps and the force used in delivery. They are often compound, associated with intracranial hemorrhage and more or less severe injury to the brain itself. Most cases are stillborn; nearly all the others die shortly after birth either from asphyxia or cerebral hemorrhage. Convulsions are a common sequel, and are due to cerebral hemorrhage.

Treatment is stimulation by mustard baths, hypodermics of strychnin sulphate gr. $\frac{1}{300}$ and atropin sulphate gr. $\frac{1}{1500}$, but is not of much avail. Recovery very rarely occurs.

Spoon-shaped depression of the skull is due to pressure of the promontory of the sacrum or to improperly applied forceps. It occurs in one or both parietals and is simply a dent in the bone. It is not accompanied by fracture, the child shows no symptoms, and if let alone, the depression disappears in one or two years. Treatment is unnecessary.

Fracture of the arm is usually a separation of epiphysis and

diaphysis, and the result of extraction of the arm in delivery of a breech presentation.

Treatment.—Fix the arm in the Velpeau position, with a small pad of cotton in the axilla, and hold the arm in position by means of an undershirt, with only one sleeve (for the *sound* side), laced down the front. Healing is complete in about three weeks; bandages, plaster-cast or adhesive straps are not necessary.

Fracture of the clavicle occurs most often in breech presentation, in delivery of the head. It can occur in head presenta-

FIG. 190.—Spoon-shaped depression of the skull, due to pressure of the promontory of the sacrum. (*De Lee.*)

tions, when the anterior shoulder is pulled under the symphysis, and can be entirely spontaneous. In every case, the clavicle should be palpated for possible injury, or the fracture may be overlooked until the child shows disability in one arm. The dressing is the same as for a fractured arm.

Fracture of the leg, seen only in podalic version, or in breech presentation, is treated by extension and fixation. The accident is rare.

Decapitation is sometimes seen in breech presentations, where, in efforts to extract the head, the neck is broken and the head pulled off. This accident can be avoided, if fracture of the neck occurs and the neck begins to stretch alarmingly, by craniotomy and extraction, before the head is entirely pulled off. If the head is detached, craniotomy is the method of extraction, and *never* cesarean section.

Caput succedaneum is the local edema of that portion of the scalp which corresponds to the opening of the dilating

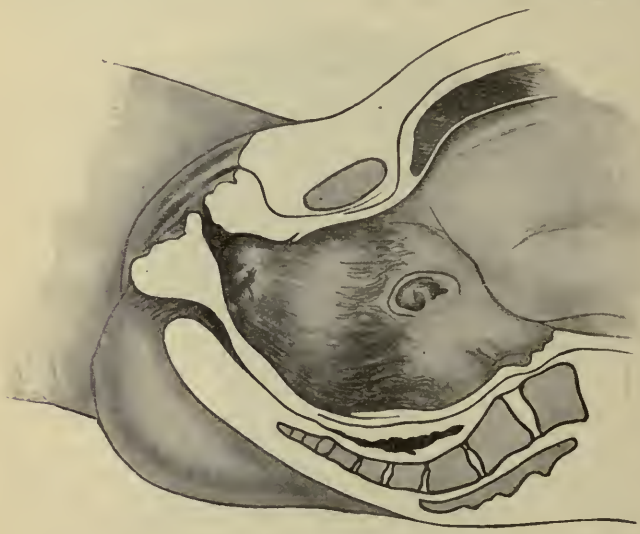


FIG. 191.—Caput succedaneum. (*De Lee.*)

cervix. It is usually associated with considerable distortion of the head, by excessive moulding. It is present at birth, does not fluctuate, is brawny and tough to the feel, and disappears, with the distortion of the head, in twenty-four to forty-eight hours. No treatment is required.

Cephalhematoma is a localized subpericranial hemorrhage, confined to one or both parietal bones, and is always due to injury—either forceps, or the pressure of the promontory or

spines of the ischium. There is sometimes a linear fracture of the skull with it. It appears after birth, is soft and fluctuating and at the edge of the swelling, the sensation is that of a depressed fracture. As the clot stimulates activity of the periosteum, there is often crackling over the swelling. Cephalhematomata disappear spontaneously in two to eight weeks, and should never be opened, unless they suppurate or increase uninterruptedly in size. The danger of operation is meningitis, as the thin skull offers little resistance to infection.

FIG. 192.—Double cephalhematoma. (*E. P. Davis.*)

Sloughs of Scalp.—Prolonged pressure will often cause the scalp to slough over a small area, frequently with devitalization of the bone and formation of a small sequestrum. Treatment is surgical cleanliness, and the removal of the sequestrum, if it forms, but healing is slow.

Bruising of the face, forehead, and neck with actual abrasion of the skin and the formation of hematomata, is not uncommon. It is a sequel of forceps delivery and is treated by cleanliness, boric acid ointment (gr. xx to one ounce) and cold compresses.

Birth palsies may effect parts supplied by any nerve on which there has been pressure or excessive traction.

Facial paralysis (Bell's palsy) may be unilateral or (rarely) bilateral. It is due most often to pressure by the forceps, where the nerve leaves the stylomastoid foramen, but has occurred in spontaneous labors, or after the head has been delivered, in efforts to deliver the shoulders. The paralysis is of short duration as a rule, but may persist for long periods. Spontaneous recovery, without treatment, is the rule.

FIG. 193.—Facial paralysis (Bell's palsy) due to forceps pressure in delivery. (*Budin.*)

Erb's paralysis is due to injury of the fifth and sixth motor roots of the brachial plexus, nearly always by traction efforts in delivery of the after-coming head, or by forceps blades. The arm hangs flaccid, the hand rotated inward and the thumb pointing back. Sensation is preserved, but motion lost, and the muscles rapidly atrophy.

Prognosis is not good. Paralysis resulting from forceps crushing is less serious than that due to traction on the after-coming head, as in the latter the nerve roots are torn loose from

the spinal cord. Unless great improvement is seen within a month, recovery is unlikely.

Treatment.—Largely preventive, in avoiding undue violence in extraction. An *x*-ray picture is desirable, to show possible fractures or dislocations of the clavicle or humerus. Electricity and massage will aid, if the nerve roots are not destroyed. Transplantation of nerves has been tried, with some success.

FIG. 194.—Erb's palsy, due to injury of the cervical roots of the brachial plexus. (*E. P. Davis.*)

Rupture of the sternocleidomastoid muscle sometimes occurs as a result of efforts to deliver the after-coming head. A local hematoma forms, which is easily palpable, and later the entire muscle is tender and rigid. Spontaneous recovery, without treatment, is the rule.

Infection of the new-born may effect the lungs or the umbilicus. That of the lungs is called *inspiration pneumonia*; it is not a true pneumonia but a septic pneumonitis.

Inspiration Pneumonia.—Causes.—(1) Inspiration of mucus, as in threatened asphyxia; (2) mouth-to-mouth insufflation in attempts to revive an asphyxiated child.

Symptoms.—(1) High fever (105 or over) appearing on the second or third day; (2) very rapid respiration (80 to 120); (3) cough, variable but often incessant; (4) cyanosis; (5) inability to nurse and restlessness.

Diagnosis is made from the symptoms more than the physical signs. Only a small area of the lung may be involved, there is rarely demonstrable dulness, and there is no sputum. If a child shows a high fever within forty-eight hours of birth, especially if there has been a difficult delivery and asphyxia, the cause is almost always inspiration pneumonia.

Treatment.—(1) Artificial feeding, by mother's milk drawn in a number 3 Phœnix breast pump and fed to the child with a medicine dropper. The child cannot usually nurse from the breast; (2) mustard bath for fifteen minutes every three hours; (3) brandy five drops, tincture of digitalis ½ drop, every four hours; (4) keep child undressed, wrapped in blankets, and disturb as little as possible, except for the necessary treatment; (5) in severe cases, antistreptococcic serum, 20 mils hypodermically, once daily. The child should be kept wrapped in blankets and not dressed.

Prognosis is grave. Relapses are common, and the mortality is 33 to 40 per cent.

Mustard Bath.—(1) Three bedroom pitchers (about four gallons) of water at a temperature of 105° F., poured in the baby's bathtub; (2) add one tablespoonful of mustard flour; (3) hold child in this bath, immersed up to its neck, with head supported along nurse's arm, for fifteen minutes. The skin should be gently rubbed during the bath; (4) wrap in warmed blankets, and do not dry for one-half hour.

Umbilical infection (omphalitis) is shown by a pouting umbilical stump, covered with a gray-green slough, and a red area around the umbilicus. The child has a high fever, and is

obviously very ill. The treatment is surgical cleanliness, stimulation (brandy ♏ v., tincture digitalis ½ ♏—every three hours) and antistreptococcic serum 20 mils hypodermically once daily. There is danger of septic infection of the blood current.

Mastitis.—The breasts of both sexes, but more frequently the male, become engorged or inflamed in the first three weeks after birth. Colostrum is present from the end of the first to the third week. The breast is hard, painful, the skin red, and occasionally an abscess forms.

Treatment.—(1) Avoidance of massage or squeezing, in an attempt to empty the glands; (2) application of leadwater two ounces, 95 per cent. alcohol three ounces; (3) oiling of skin, to relieve tension; (4) early operation, if suppuration occurs.

Menstruation.—A bloody discharge from the genitalia of female children is not rare. The discharge is typical of true menstruation, but lasts only two or three days. In precocious development, however, regular menstruation has been established as early as the seventh month of infancy. No treatment is required.

Mouth Infections.—*Aphthæ* are small, pearly vesicles seen in the mouth, on the gums and lips.

Thrush is a coalescence of white spots, surrounded by an areola of reddened mucous membrane. The infecting agent is the saccharomyces albicans.

Treatment for both is washing the mouth, gums and lips with 10 grains to the ounce boric acid solution, every three hours and after each nursing.

Ophthalmia neonatorum is infection of the child's eyes, usually, but by no means always, due to the gonococcus. Antiseptic solutions used in labor may produce an ophthalmia indistinguishable, except bacteriologically, from gonorrheal.

A *benign* subacute conjunctivitis is often seen, affecting usually one eye, which answers promptly to irrigation by boric acid solution (gr. x to oz. ii), and does not require energetic treatment.

True ophthalmia begins usually forty-eight hours after birth.

The eyelids are very edematous, and a copious yellow discharge oozes from between them. Gonococci can be found in the discharge. The conjunctiva looks like red velvet, and the cornea later loses its epithelium and is often ulcerated.

Treatment.—If the mother is suspected of having, or known to have, gonorrhea, the vagina should be thoroughly cleansed with tincture of green soap and hot water, during the first stage of labor, and the cleansing is repeated once or twice until the head is on the perineum. As soon as the child is born, the eyes are washed with boric acid solution, and two drops of a 2 per cent. nitrate of silver solution (gr. x to one ounce) are dropped in each eye, with a medicine dropper, being careful to separate the lids and *not* to try and put the point of the medicine dropper between them (*Credé method*).

If ophthalmia develops, the curative treatment is: Irrigation of the eyes, every two hours, day and night, with 10 gr. to one ounce boric acid solution; (2) cold compresses on the lids constantly; (3) twice daily instil 25 per cent. argyrol solution, or 10 per cent. silvol solution, with a medicine dropper; (4) once daily, 1 per cent. nitrate of silver solution is instilled; (5) if only one eye is affected, bandage the other, to protect it; (6) watch carefully for corneal ulcer.

Technic of Irrigation of the Eyes.—(1) Wrap child up to its neck in a thin blanket; (2) place two chairs facing each other; (3) sit in one chair, place child's body on the other and take its head between your knees; (3) as both hands are free, separate eyelids with one hand and inject boric acid solution with the other; (4) it is best to use a stream of solution from a saturated cotton pledget, rather than a medicine dropper, as there is then no danger of injury to the eye.

Caution.—As the discharge from the eye is exceedingly infectious, and if any should get in the eyes of the person caring for the child serious ophthalmia and probably blindness would result, great care in handling should be observed. These cases are best handled only with rubber gloves.

Prognosis.—Recovery is the rule, with careful treatment, without corneal opacity.

Syphilis of the infant has been sufficiently considered under diseases of the fetus.

Snuffles (coryza) are due usually to cold from drafts. The child's crib should be properly protected, and it should wear a cap until nature has provided sufficient hair. A coryza that is excoriating and shows crusts and irritation around the nostrils is probably syphilitic and is treated accordingly.

Hemorrhage from the umbilicus (omphalorrhagia) may occur before or after the cord has dropped off. If it occurs before the stump has dropped off, the first ligature is too loose and a second is needed.

Bleeding from the umbilical ulcer is often serious. If the vessel or vessels can be seen, they may be ligated, but this is usually not practicable. A stump sufficient to tie can nearly always be pulled out of the umbilical ring, by a tenaculum, transfixed with a sterile safety-pin, and tied under the pin. If this is impossible, a pad of sterile gauze, shaped like a pyramid is placed in the umbilical ring, with the point of the pyramid down, and held by adhesive straps. As a last resort the abdominal wall may be transfixed below or above the umbilicus, with large straight needles, and a figure-of-8 ligature tied around the needles. Horse serum is invaluable, if the bleeding is due to hemophilia or the blood is deficient in clotting power. Locally, styptics like Monsel's solution, powdered adrenalin or bismuth may be tried, but all usually without permanent effect.

Umbilical fungus is a red, strawberry mass of granulation tissue, projecting from the umbilicus. If it is cauterized with solid stick nitrate of silver, it will usually disappear. Twenty per cent. require amputation, however. If the stump of the cord persists and does not drop off, it too must be amputated.

Omphalorrhea is a constant, or periodic, seropurulent discharge from the umbilicus, due to a patent urachus.

Sudden death of the child may be due to: (1) Patulous foramen ovale or other congenital heart lesion; (2) thymus

gland hypertrophy; (3) cerebral injuries in birth; (4) overlying by mother in bed. These are the most common causes.

Patulous foramen ovale causes what is usually called a "blue baby." The prognosis of this, as in other congenital heart lesions, is fairly good. Compensation is often established during the first month of life; if the condition persists, the child is delicate and must be managed with great care; many will die suddenly in the early weeks of life.

Medicines in the New-born.—Mercury is better borne than any other drug, and can be given in large doses. Calomel gr. ½ in divided doses of ⅟₂₀ each; mercurial ointment gr. x by inunction are examples. *Opium* is not borne at all, even as paregoric, of which three drops have been fatal. Even the paregoric and ergot mixture given to the mother for the control of after-pains, (℥ss of each to the dose—every 4 hours) has caused evidence of opium poisoning in the nursing infant. Other drugs are given in doses proportionate to the age of the child.

CHAPTER XIX

OBSTETRIC OPERATIONS

PREPARATION FOR, TECHNIC AND AFTER-TREATMENT OF OBSTETRIC OPERATIONS

The preparation for obstetric operations is the same as for any plastic (for vaginal delivery) or abdominal section, with the rather important exception, that most of these operations are of an emergency character, and the time for preparation is, therefore, limited. When time permits, the following preparation will be found satisfactory.

Preparation for Abdominal Section

Day Before Operation.—Urine examination, blood count and full bath. 4 P. M. Scrub abdomen and upper ⅓ of thighs for ten minutes by the clock, using soft bristle brush (face brush) or gauze; after first two minutes shave *completely*. Rinse off soapsuds, and scrub for one minute in alcohol (95 per cent.) using fresh brush, rinse off again with sterile water, dry with sterile towel, and apply dry sterile gauze dressing with binder, covering abdomen and upper ⅓ of thighs, and bandaged so that it cannot ride up. Light supper.

9 P. M. Magnesium sulphate ½ ounce, or magnesium citrate *flat* 6 ounces. If nervous, veronal 10 grains.

Day of Operation.—Early in morning, cup of beef tea, no other breakfast.

Two hours before operation repeat scrubbing of day before, except that shaving is omitted, and after alcohol, apply dressing moist with 1 per cent. formalin solution, held in place by same kind of binder. An hour and a half before operation cleanse lower bowel by simple enema so that last enema returns clear.

Three quarters of an hour before operation give hypodermic of morphin sulphate gr. $\frac{1}{6}$, atropin sulphate gr. $\frac{1}{150}$. Catheterize just before etherization, and *never* trust to voiding. *The nurse who does the scrubbing must prepare her hands and wear sterile gown and sterile gloves, as for an operation.*

No preparation on the table except wiping abdomen with 95 per cent. alcohol.

Rubber dam used in all sections, covering the abdominal skin, and operation is done through a slit in the dam, which is sewed in the wound.

In emergency cases, where time is limited, or where abdomen is very sensitive, cover abdomen, *after* shaving, with gauze, *dripping wet* with tincture of green soap, and cover with binder; after two hours, take off gauze, wipe abdomen with alcohol 95 per cent. and apply wet dressing of 1 per cent. formalin for two hours, held on by binder. *Do not use iodin.*

Iodin is not safe, because in strengths of less than 12 per cent. it is useless as a skin antiseptic, and this strength will cause severe desquamation. It is also carried in the abdomen on the operator's gloves, and its use is certain to be followed by adhesions.

Preparation for vaginal delivery or any other vaginal manipulations, such as induction of labor, etc.

1. The pubic hair should be shaved.

2. The rectum and lower bowel should be evacuated by repeated enemas, till the water returns clear.

3. The patient is arranged in the dorsal lithotomy position, preferably on an operating table, or one improvised from a kitchen table.

4. The vulva and vagina are thoroughly cleansed with cotton, tincture of green soap and sterile hot water, and if any antiseptic vaginal douche is given, it should be followed by a douche of sterile water, because of danger of the antiseptic fluid causing ophthalmia in the baby.

5. This cleansing is always better done under the anesthetic, especially in primiparæ. If no anesthetic is used, as in

the induction of labor, the vulva is carefully scrubbed and the vagina cleansed as above, in a multipara, or douched in a primipara. Proper cleansing in a primipara is almost impossible without anesthesia.

6. Just before anesthetization, the patient should be catheterized, and never trusted to void. It is most essential in forceps operations that the bladder be empty.

Preparation of Private Houses for Operations.—As most of the obstetric work in general practice is done in the patient's home, the following instructions will prove of value. They are designed to meet the requirements of gynecologic operations as well as obstetric.

It is perfectly feasible to arrange private houses for operations so that the lack of hospital facilities need not be felt. An abdominal operation is, of course, more easily done and the patient more easily cared for in a hospital than at the patient's home, but even this type of operation can be adequately cared for at home, provided the preparation is sufficiently well made. Ordinary operations, especially plastics for the repair of the injuries of child-birth, are satisfactorily done in the patient's home. A trained nurse, or one at least accustomed to the care of surgical cases and with a working knowledge of asepsis, is most desirable, but not indispensable, provided the physician is willing to give minute instructions as to the care required and to attend to such details as catheterization himself.

The Choice of a Room.—If possible, the room should be one adjoining the patient's bedroom, and preferably not the patient's own room. The patient is thus spared the sight of the necessary preparation. The paramount question is one of light, and the operating-table should be so placed as to get the maximum amount, hence, near the window. The window can be screened against outside observation by covering it with a single piece of gauze or by pinning together the curtains, provided they are of a material which will transmit the light without too much diminution, or even by soaping or

whitewashing the pane of glass. Except for an abdominal operation it is not necessary to strip the room or take up the carpets or rugs. The floor can be protected by newspapers, thickly laid, and over these a sheet, wrung out of a 1–1000 bichlorid solution, should be spread and should be damp when the operation is begun. Any unnecessary hangings ought to be removed and the furniture moved to a part of the room where it will be out of the way and covered with sheets.

The walls in the immediate vicinity of the operating-table should be protected by sheets held up by the glass-headed pins known as Moore's push-pins, and not by tacks. The pins leave no scar, as tacks do, especially in wall-paper and plaster.

The Operating Table.—This should preferably be one of the models of portable, collapsible operating-tables, but this is by no means a necessity. A kitchen table with sufficient strength of legs answers every purpose. If this is used, the top must be thoroughly scrubbed and then thickly padded, as the thinly padded table is a prolific cause of backache after operations. In many operations, notably perineal operations, a Kelly pad is a desirable addition; but one that will answer every purpose can be improvised by rolling up rubber sheeting at the sides and back, or even newspapers covered by towels or sheets. The special tables are provided with stirrups and leg-holders for the lithotomy position, when this position is desired. The kitchen table can be equipped with either the Edebohls' portable leg-supports, which clamp on the edge of the table, or, much better, by a rolled sheet tied about one knee, passed back over one shoulder and out under the other (so that pressure does not come altogether on the patient's neck) and fastened above the other knee. The knots should be on the outside of the legs. This makes the best leg-holder I know. If the Edebohls' supports are used, it will be found necessary to tighten the screws with a wrench (no one's fingers are strong enough), for, if the patient should strain, the leverage is enormous. If a chair or stool is needed, a piano-stool draped with a sheet is most satisfactory, but a

plain chair (not too low) will answer. The end of the Kelly pad, or its substitute, should drain into a bucket or slop-jar which has been well scalded out.

The special operating-tables have apparatus for the Trendelenburg position; the kitchen table can be equally well equipped by raising the two legs on blocks or bricks, or even, if the extreme position is desired, on the seats of two chairs. The

FIG. 195.—Lithotomy position with limbs supported by a sheet-sling. (*De Lee.*)

whole table is best draped in a sheet, although this is not essential.

Instrument- and Dressing-tables.—Two of these are required, one on either side of the operating-table. As these tables often have polished tops, adequate protection must be provided. This is best done by covering the top thickly with newspapers, placing on these a large tin tray and covering

all with a sheet, draped so that it will touch the floor on all sides. This is to protect the legs and sides.

Douche-bag.—This is needed in all perineal operations, and a more efficient means of splashing the wall-paper than an improperly hung douche-bag can hardly be devised. A suitable hook is provided, preferably in the window-frame. An open towel is placed over this hook so that the center of the towel is over the hook. The bag is hung on the hook and the towel allowed to drape down over it. This has proved an adequate protection. The douche-bag and tube are, of course, prepared by boiling.

Instruments.—It is best to boil these where the physician and nurse can keep an eye on them. A large alcohol lamp and a copper tray sterilizer or basin will be satisfactory. If an alcohol lamp is placed in the bath-tub, and the instruments are sterilized there, it will guard against the danger of upsetting them and possibly a conflagration.

If the instruments are sterilized over the kitchen stove, servants must be warned not to touch them. I have seen a servant dig the various instruments out of the sterilizer with a stove-lid lifter and speculate on their uses.

Dressings.—For all ordinary operations the commercially sterilized gauze and cotton are entirely satisfactory. For abdominal operations the dressings should preferably be steam sterilized either in an autoclave or even in a Rochester steam sterilizer. If the latter is used, the final sterilization should be completed just before the operation. It is not possible adequately to dry dressings so sterilized, and it is better to have them warm and wet than cold and clammy. Sheets and towels can be adequately prepared by freshly laundering them and then ironing with an iron hot enough to come just short of scorching them. The time-honored custom of baking in the oven of the kitchen range is useless. Such dressings are not sterile unless so scorched as to be unfit for use. For gauze sponges, I have always found the commercially sterilized gauze safe. If sea sponges are used, they must be soaked

overnight in a 1–500 bichlorid or a 1–20 phenol (carbolic acid) solution. Boiling them destroys their absorptive qualities.

Basins.—Unless the physician carries his own nest of basins, he must depend on the household supply. Three at least are needed and they must be boiled. Rinsing or wiping them out with an antiseptic solution is not sufficient.

Scrubbing.—The best arrangement for scrubbing up and sterilizing the hands can be made in the bath-room. Running water and previously boiled nail-brushes are used, and to obviate stooping over, the dishes of soap, alcohol, etc., can be arranged on a bread-board placed over one end of the tub and resting on the sides of the tub.

Rubber Gloves.—Steam sterilized and, hence, dry gloves are best, but this is not always practicable. Boiling is a method always available and is satisfactory. The gloves must be boiled wrapped in gauze or a towel, and should always be boiled flat so that the water can enter them. The custom of boiling gloves rolled up in a ball is a pernicious one, as the inside of these gloves is never sterile and most of the outside is open to grave suspicion.

Sterile Water.—The night before operation a clothes-boiler is filled with water. In it are placed three pitchers and a dipper with a hooked handle. These are boiled for half an hour. The pitchers are hooked out of the water with the handle of the dipper and filled, and then towels are tied over their tops and they are set aside to cool over night. The next morning the clothes-boiler full of water and the dipper are boiled again. Thus by mixing the cold water that has stood over night with the hot water boiled just before the operation a supply ample for most operations is secured.

In emergencies, the bottled water sold at all drug stores is adequate for the cold sterile water, except in abdominal operations. The water in the pitchers can be cooled in a reasonably short time by pouring cold water over the outside of the pitchers.

Supplies Required.—The supplies needed for an ordinary operation are as follows: six sheets; twelve towels; 8 ounces of 95 per cent. alcohol; 8 ounces tincture of green soap; 1 pound of absorbent cotton (two half-pound rolls); one 5-yard roll of sterile gauze; one 1-yard jar of iodoform gauze; one bottle of mercuric chlorid tablets; one 2-ounce bottle of glycerin (as a lubricant for putting on wet gloves; two ¼ pound cans of ether, unopened; three small coarse (not silk) sponges, size of a lemon; one 1-yard package of sterile gauze (for the etherizer, to avoid opening the larger package). I have this list printed on cards, and one is sent to the patient's house to guard against details being forgotten.

Nurse's Kit.—I find it useful to provide the nurse who does all the preparing of houses for me with a bag equipped with what we have found needful. This bag is small and easily carried, but contains eleven basins, twelve brushes, twelve pairs of rubber gloves; all the catgut used in the operation (from eight to ten boxes being carried); a Kelly pad; douche-bag; razor for shaving patients (especially in perineal operations); gown and uniform; the glass pins (three dozen) used for protective sheets, and a roll of safety-pins.

It is perhaps unnecessary to point out that all visible disturbances caused by these preparations should be cleared away, and all soiled linen and sponges and water disposed of as soon as possible. This is particularly desirable when everything has been prepared in the patient's room. No signs should be left for the patient to see on recovery from the anesthetic.

Preparation of the Doctor's Person and Hands.—The attendant on an obstetric case should wear a sterile operating suit, and not his ordinary every-day clothes; a sterile short sleeved gown (preferable to the long-sleeved gown, because certain operations (version—for instance) are impossible with a long sleeved gown—as the arm will not enter the vagina further than the end of the cuff of the glove); and sterile (either wet or dry) rubber gloves.

Preparation of the Hands.—The hands should be cleansed as carefully as if no gloves were to be worn. The following method will be found satisfactory: (1) The nails are to be kept short, and smoothly trimmed.

(2) Scrub for ten minutes (by the clock) with tincture of green soap, running hot water and a fairly stiff nail-brush, being careful to devote an equal amount of attention to each hand.

(3) Scrub for one minute in 95 per cent. of alcohol, using a fresh brush.

(4) If dry gloves are to be worn, the hands are dried on a sterile towel and powdered with sterile talcum. If wet gloves are used, no drying of the hands is needed.

There is a greater chance of infection in obstetric cases than any other surgical case. The nearer an obstetric case is managed like a major surgical operation the better will be the immediate and remote results.

Routine After-care of Abdominal Sections.—These directions must be considered together with the normal routine care of any normal delivery, in a patient delivered by abdominal section (cesarean section, pubiotomy or symphyseotomy).

1. Elevate head of bed on blocks twelve inches.
2. Morphin sulph. gr. $\frac{1}{6}$
   Atrophin sulph. gr. $\frac{1}{150}$ } sixth hour p. r. n.
3. Water p. r. n. in ounce quantities as soon as nausea ceases.
4. Catheterize sixth hour p. r. n.
5. If wound sealed with collodion, take off outer dressing after six hours and put icebag over wound. Keep ice-bag on for first 3 days.
6. After twenty-four hours feed by albumen water, broth, or milk and limewater equal parts, 1 to 2 ounces every hour.
7. After twenty-four hours give enema: milk of assafetida oz. 6, Hoffman's anodyne dram 1, water q. s. ad. 1 pint.
8. If much nausea, wash out stomach by giving 2 glasses of water with 5 grains of sodium bicarbonate to each glass. If this does not stop it, wash out with tube.

9. After forty-eight hours give calomel gr. $\frac{1}{6}$ every hour for six doses, followed in two hours by magnesium citrate 6 ounces.

10. After bowels move give soft diet, fifth day give light diet, seventh day give full diet.

11. If much distention, give eserin salicylate gr. $\frac{1}{40}$ hypodermically fourth hour, and pituitrin $\frac{1}{2}$ ampule twice daily hypodermically.

12. If urine output is low, give spartein sulphate gr. 1, hypodermically sixth hour and force water.

13. Collodion dressing off eighth day, and wound dressed thereafter every other day with dry sterile gauze.

14. As a routine laxative use compound cathartic pills, one at bed time. If too active give only half a pill. If griping use A. B. S. & C. pill.

The routine after-care after operative vaginal delivery is that of a normal delivery. If any stitches have been inserted, they are cared for as follows:

1. Irrigate perineal stitches with sterile water four times daily, and also after each urination or bowel movement, and keep sterile vulvar pad in place after irrigation.

2. If stitches soiled, clean with cotton on applicator and peroxid of hydrogen.

3. Vaginal douche sterile water every day after fifth day.

4. Stitches inserted directly after delivery can safely be removed on the tenth day.

INDUCTION OF ABORTION

Induction of abortion is the premature termination of pregnancy prior to the sixth month of pregnancy, (or the date of viability of the child)

Indications.—(1) Pernicious vomiting, where all other means of control have failed, and further delay means the death of both mother and fetus; (2) severe kidney breakdown, in early pregnancy, most likely due to a pre-existing nephritis; (3) placenta prævia, with severe hemorrhage; (4) severe constitutional disease, such as heart disease or tuberculosis,

threatening the life of the mother; (4) pernicious anemia. It is wise never to induce abortion without a consultation, so that the responsibility may be shared and criticism avoided.

Technic of Operation.—The method of operation varies with the date of pregnancy. The administration of abortifacient

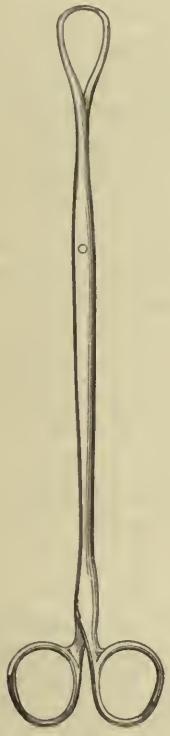


FIG. 196.—B. C. Hirst's double tenacula for the cervix.

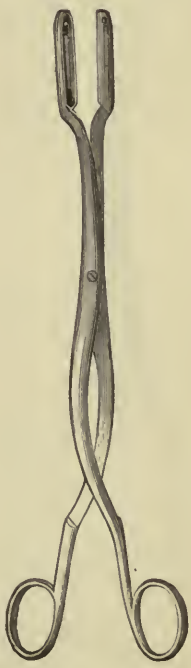


FIG. 197.—Emmet's curet forceps.

drugs, like tansy, pennyroyal, etc., is of no value. All these drugs are active poisons, and if given in large doses cause a severe and sometimes fatal gastro-enteritis and toxic nephritis. Pituitrin is useless.

Up to the third, or possibly the fourth, month of gestation, the technic is as follows:

1. The patient is shaved and prepared locally as for any vaginal operation.

Fig. 198.—Ovum forceps to be used when the embryo is too large to be broken up easily with the Emmet curetment forceps; they require considerable dilatation of the cervix.

2. A general anesthetic is advisable, but as many of these patients are poor surgical risks, local anesthesia may be required.

3. The patient is arranged in the dorsal position on an operating or kitchen table, and not in bed.

4. The anterior lip of the cervix is caught with a double tenaculum, and the tenaculum is held by an assistant.

5. With branched dilators, the cervical canal is dilated to about one and a quarter inches transverse diameter, or about the size of the thumb.

6. An Emmet curettement forceps is inserted in the uterus, the ovum broken up and whatever portions can be easily removed are pulled out. This step should cease as soon as the bleeding becomes free.

7. The uterus is washed out with sterile water, through a Bozemann two-way uterine douche-nozzle.

8. The uterus and vagina are packed with sterile or iodoform gauze.

9. The patient is returned to bed.

10. Twenty-four hours later the patient is again placed on the operating table, without anesthesia. The packing is re-

moved. The anterior lip of the cervix is caught with a double tenaculum. The remains of the ovum are removed from the uterine cavity with Emmet curettement forceps, and the uterus washed out.

11. Repacking is not necessary, nor is curettement needed to remove the decidua.

12. The patient is kept in bed for seven to ten days. It is not possible to evacuate the uterus at one sitting, without an unjustifiable loss of blood. These patients are usually bad surgical subjects, and the less prolonged the operation the better.

Local Anesthesia.—Unless the patient is unruly, the operation can be performed under local anesthesia.

The solution used is 1–400 novocain solution, with ten drops of 1–1000 adrenalin solution to each fluid ounce of the mixture. A syringe of 10 mil capacity is most convenient, and the points of injection are: (1) Directly anterior to the cervix, at the junction of the vaginal mucosa; (2) directly posterior to the cervix; (3) to each side of the cervix, in the lateral vaginal vaults; (4) if the cervix be considered as a clock face, straight into the cervical muscle at three and nine o'clock, parallel to the cervical canal.

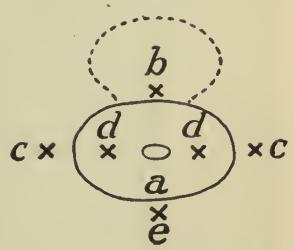


FIG. 199.—Points of entrance of the needle in infiltration of the cervix in local anesthesia by novocain or other solutions, preliminary to dilatation or anterior vaginal hysterotomy. *a*, The cervix; *b*, anterior infiltration under the bladder; *c*, *c*, lateral infiltration; *d*, *d*, infiltration of the cervical muscle, parallel to the cervical canal; *e*, posterior infiltration. The crosses are the points of insertion of the needle.

The solution is practically nontoxic, and large amounts can be used with impunity. When novocain cannot be secured, β-eucain 4 per cent. or cocain 2 per cent. will be satisfactory, but must be used sparingly.

Packing.—The most convenient packing is made from a six-inch gauze bandage, six yards long. The bandage is folded

from each edge to the middle and then down the middle again, thus giving four layers thick, one and one-half inches wide, with no free raveling edge. The six yards of packing are packed in a glass tube or jar, autoclave sterilized, and used directly from the tube or jar. Plain gauze is satisfactory and much cheaper than iodoform.

After-treatment is that of any plastic operation. (1) Rest in bed seven to ten days; (2) light diet; (3) bowels moved in

FIG. 200.—Uterine or vaginal packing; 5½ yards of four thickness gauze; 1½ inches wide; put up in the ordinary 1 yard iodoform gauze jar and autoclave sterilized.

forty-eight hours by magnesium citrate six to twelve ounces, and thereafter daily laxative if needed; (4) vaginal douche of sterile water daily after the third day.

Complications are (1) Hemorrhage; (2) septic infection; (3) perforation of the uterus.

Hemorrhage is not likely to be severe and can be controlled at any time by uterine packing.

Septic infection is not likely unless the case is already infected, or portions of the ovum left behind. The uterus is cleaned out, and douched daily, as per directions given in the local treatment of puerperal sepsis.

Perforation of the uterus is not likely unless an attempt be made to evacuate the uterus, with the patient in bed; or too much force used with the instruments. Should the uterus be perforated (recognized by the placental forceps suddenly slipping far in, with no resistance) all further attempts at evacuation should be, for the present, discontinued. The uterus is packed, the posterior vaginal vault opened into the pouch of Douglas and packed; the patient put to bed in the Fowler position, and no attempt made to remove the remainder of the ovum until after twenty-four hours. Then the uterus can be evacuated, *but not douched.* Abdominal section is unnecessary, if this plan be followed.

The method of induction of abortion described above is not possible, after the fourth month, because the fetus is then too resistant to be broken up easily. If pregnancy must be terminated between the fourth and sixth months, two plans are open: (1) One of the methods of inducing labor; (2) anterior vaginal hysterotomy (usually miscalled vaginal cesarean section). Both these will be described under their proper headings.

INDUCTION OF LABOR

The induction of labor is most common after the seventh month of pregnancy. From the fourth month on, the same indications apply as for the induction of abortion. After the child becomes viable, the indications are: (1) Contracted pelvis, provided the contraction is not of sufficient degree to demand induction of labor more than two or, at the very most, three weeks before term; (2) toxemia of pregnancy (kidney insufficiency or premonitory signs of eclampsia); (3) prolongation of pregnancy (more than two weeks beyond term, provided the physical signs point to maturity of the child); (4) grave disease of the mother (tuberculosis or valvular heart disease with broken compensation); (5) habitual death of the fetus, shortly before full term; (6) placenta prævia (by one of the methods described under the head of placenta prævia.)

Methods

I. **Drugs.**—When a patient is at or very near term, it is possible to induce labor by means of drugs.

It is worth a trial, is efficient in about 60 per cent. of cases and only at term. As a means of inducing premature labor, it is useless. If the first trial fails, it is often successful if repeated in forty-eight hours.

Technic.—(1) If possible, give ten drops of tincture of nux vomica four times daily for four days previous to the day selected for induction. (2) On day selected, give calomel gr. ⅛ every hour for eight doses. (3) When last dose of calomel is given, give one ounce of castor oil. (4) At time of first movement from oil, give ten grains of quinin. (5) Twenty minutes later, give ½ mil. of pituitrin hypodermically.

The method is not entirely free from danger, due to the stormy action, occasionally, of the pituitrin. This should never be given, if after the oil and quinin, the patient has begun to have labor pains.

II. **Krause's Method.**—Flexible bougies inserted in the uterus. This method is one of the safest for the general practitioner, but is only about 80 per cent. efficient. If proper asepsis be observed, no harm can be done. The method is difficult or impossible of performance if the head be firmly engaged.

Technic.—(1) The patient is arranged in the dorsal position, on a table (and *not* in bed), and prepared locally as for any vaginal operation. Careful scrubbing of the vagina is essential to safety. (2) An anesthetic is ordinarily not required. (3) The anterior lip of the cervix is caught with a double tenaculum, and held by an assistant. (4) The operator places two fingers of his left hand in the vagina, and the tips of these fingers in the cervix. If necessary, the required dilatation may be secured, almost painlessly, by branched dilators. (5) Along the groove between the fingers, are passed, one after the other, two number 17 (or number 6 American) French flexible silk

and wax bougies. They should go straight (without coiling) between the membranes and posterior uterine wall, until only one inch is outside the cervix. (6) The vagina is packed with gauze, to hold the bougies in. (7) The patient is put back to bed.

The bougies are sterilized in *cold* 1–500 bichlorid or 1–20 carbolic or 10 per cent. formalin. They are wrapped in gauze before being placed in the solution, as they will float, and should *never* be coiled up. They cannot be boiled. They must remain in the solution for at least one hour before being used. They should be limber enough to bend easily when tested, but not so limp as to be difficult of insertion; if too stiff they are liable to puncture the membranes. It is common to have them tunnel under the edge of the placenta, with fairly free hemorrhage for a few minutes. The bleeding ceases quickly and is of no moment. Labor pains may be expected in half an hour to twelve hours. Usually pains begin within four to six hours, and 80 per cent. of patients are delivered within twenty-four hours from the time of induction. The bougies can be removed as soon as the cervix is well dilated and labor firmly established. If after twenty-four hours, no labor pains have been instituted, it is wiser to remove the bougies, dilate the cervix and proceed as detailed in the fifth method, described below. The commonest cause of failure is that the bougies have coiled in the cervix, instead of passing straight up between the membranes and the uterine wall.

III. **Boiled Rectal Tube Coiled in the Cervix.**—This has the merit of being least likely of all methods to puncture the membranes, or do other damage, if properly used. It is not as efficient as the bougies, because it always coils up in the cervix. The method of procedure is precisely like that of the bougies, except that the tube coils in the cervix. The use of a stylet, to stiffen the tube, is not safe. The tube is sterilized by boiling, and should preferably be a new one for each case.

IV. **Rubber bags** (metreurynter) inserted in the cervix and distended with sterile water. This method is one of the most

difficult in which to preserve asepsis in performance. The insertion of the bag requires considerable handling, especially as they often slip out of place and have to be reinserted several times. The efficiency is about that of the bougies (80 per cent). The bag is supposed to dilate the cervix by hydrostatic pressure, and therefore approximate nature's method. There is this important difference, however. In labor the pressure of the amniotic sac is intermittent; the pressure of the bag is constant. This constant pressure, while it dilates the cervix, causes it to become edematous, and as the bag only secures, at the most, two-thirds dilatation, the remainder is done by the presenting part, and almost always at the expense of a bilateral tear of the edematous cervix.

Of the various bags described in the section on dilatation of the cervix, only two are adapted to induction of labor. These are the Voorhees conical bag, and the B. C. Hirst hour-glass or spool bag. These bags are made of canvas, covered with rubber. They become hard and brittle after a short time, and must then be thrown away. If, after use, they are dehydrated by filling with alcohol, their life may be somewhat prolonged. The disadvantages of the Voorhees bag are that it disappears entirely within the cervix and often displaces the presenting part, which may not return to the superior strait in a favorable position; it also elongates the cervix, when the required traction is made upon the filling tube. The Hirst bag does not project far enough beyond the internal os to dislodge the presenting part; the hour-glass bag is for the effaced cervix and the spool bag for the uneffaced. The medium size of either bag is best adapted for general use.

Technic.—(1) The patient is arranged as for any vaginal operation, on a table, and carefully cleansed.

(2) In primiparæ anesthesia is always required, and is desirable in multiparæ.

(3) The bag is tested, by being filled with sterile water. If it does not leak, the quantity of water required completely to distend it is noted. It is then rolled in its long axis, like a

cigar, grasped in placental forceps, and lubricated with sterile glycerin.

(4) The cervix is caught with a double tenaculum and dilated with branched dilators to about the size of three fingers, or 7 c.m. transverse measurement.

(5) Two fingers of the left hand are placed in the cervical canal, and the bag inserted into the cervix, along the fingers as a guide, by a rotary motion.

(6) The placental forceps are removed, and the bag held in the cervix between the two fingers.

(7) An assistant, with a metal piston syringe, fills the bag with as nearly as possible the previously determined quantity of sterile water. Air should never be used.

(8) A hemostat is clamped on the tube, two knots are tied tightly in the tube, about three inches apart and the hemostat removed.

(9) With the Voorhees bag, the tube is left outside, and the nurse instructed to pull gently on it, for one minute, every fifteen minutes, until the bag slips through the cervix. With the Hirst bag, the tube is tucked in the vagina, and held in by packing.

(10) The patient must remain in bed.

The bags are sterilized by boiling.

The Voorhees bag, when inserted, disappears above the internal os. It always dislodges the presenting part, and may cause serious dystocia by transforming a vertex presentation into a face or a shoulder.

The Hirst hour-glass bag is inserted so that the constriction of the bag corresponds to the external os, when the cervix is effaced. If the cervix is not effaced, the spool bag must be used, the shank of the spool corresponding to the cervical canal. It will be found necessary to add water to the Hirst bags about every half hour, as the yielding cervix permits more pressure. The bag should be kept fairly tense, and removed after four hours. By this time everything possible in the way of dilatation will have been accomplished, and unnecessary edema of

the cervix avoided. In fact, labor pains often begin as soon as the bag is removed.

V. Dilatation of the Cervix, Bougies and Bag.—This is the most certain and rapidly effective of all the methods. It is also a formal operation and presupposes skill in the handling of instruments, and proper equipment. About 98 per cent. of patients are delivered within eighteen hours.

Technic.—(1) The patient is arranged in the dorsal position, carefully cleansed, and *always* anesthetized.

(2) The anterior lip of the cervix is caught with a double tenaculum.

(3) By branched dilators, the cervix is dilated to a transverse measurement of 7 c.m.

(4) Two sterile bougies are inserted, in the manner already described.

(5) A Hirst hour-glass or spool bag is inserted in the manner already described.

(6) The vagina is packed with gauze and the patient returned to bed. The bag is removed in four hours and the vaginal packing changed. The bougies are left in until labor is firmly established.

VI. **Packing cervix with gauze** is often done, but is not as efficient as any of the other methods. Pains do not usually appear until after twelve hours, and the method is effective only at term, with labor imminent. The gauze is packed loosely above the cervix and tightly in the cervix and vagina, under strict aseptic precautions, and removed when labor pains seem well established. If, after a trial of these methods, the patient does not fall in labor, or if the mother's condition is such that further delay is inadvisable, the following methods of accouchement forcé are available:

(1) Dilatation of the cervix with forceps extraction.

(2) Dilatation of the cervix with podalic version.

(3) Vaginal cesarean section.

(4) Pomeroy bag (dangerous and powerful) and forceps or version. All these methods are described under their ap-

propriate headings. None of the above-described methods are available in placenta prævia. The technic of induction of labor in this complication is described in the chapter on hemorrhage due to placenta prævia.

ARTIFICIAL DILATATION OF THE PARTURIENT CERVIX

Indications.—(1) Rigidity of the cervix.

(2) Any complication requiring rapid delivery.

(3) As a step in the induction of labor.

In this operation great damage may be done. It is necessary to choose a method with a minimum of danger of laceration, or in the more violent methods, to avoid laceration if possible. A lacerated cervix opens an avenue of infection into the bases of the broad ligaments, and severe or fatal sepsis may result. The danger of laceration is greatest when the cervix is not effaced, and the more complete the effacement of the cervix, the easier and more complete is the dilatation obtained.

Methods

I. **Branched or Metal Dilators.**—(*a*) *Hegar's bougies* are a set of metal bougies varying from the size of a lead-pencil to that of the middle of the forearm. They are inserted into the cervix one after the other, in successive sizes, until the desired degree of dilatation is reached. The cervix is caught with a double tenaculum and held by an assistant. The armamentarium is clumsy, heavy, hard to transport, and the method has nothing to recommend it over others to be described.

(*b*) *Two-bladed Branched Dilators.*—The original Gau dilator has been modified by R. C. Norris, and later by the author. The instrument has blades long enough to reach through almost any cervix, even if not effaced, and the dilating force is evenly applied by a wheel-and-screw thread. It has a maximum separation of the blades of 7.5 cm., which is the limit of safe dilatation with a two-bladed dilator. In a primipara, an anesthetic is required, in a multipara none is needed.

Technic.—(1) The patient is arranged in the dorsal position and the vagina carefully cleansed.

(2) The anterior lip of the cervix is caught with a double tenaculum and held by an assistant.

(3) The dilator is inserted beyond the internal os and the blades slowly separated by the screw-wheel. About twelve

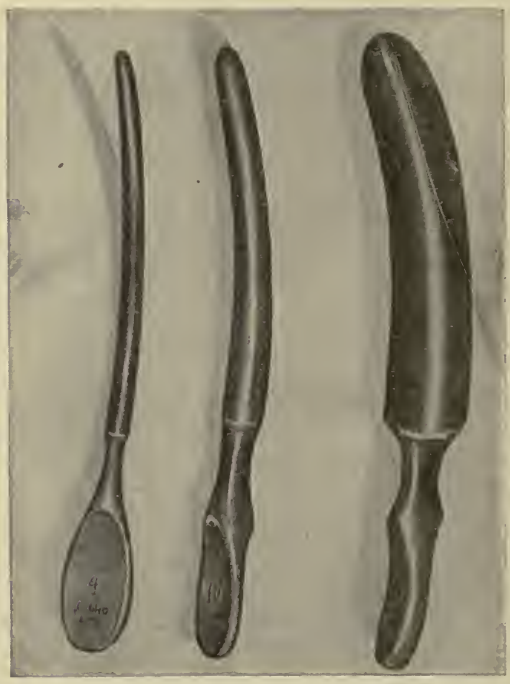


FIG. 201.—Three sizes of Hegar's dilators. There are twenty four sizes. (*De Lee.*)

minutes are required safely to dilate the cervix in a primipara to the full extent of 7.5 cm.; about half this time in a multipara.

(4) When the full dilatation is reached, the dilator is collapsed and removed. If further dilatation is required at once, it is best secured by one of the hydrostatic methods, as dilata-

tion beyond 7.5 cm. with the branched dilators is sure to result in severe laceration, particularly if the cervix is not effaced.

(*c*) *Four-bladed branched dilators* are all powerful instruments, and should be used only with caution. Any greater dilatation than 5 cm. is sure to be followed by extensive lacerations. All these four-bladed dilators are capable of securing a dilatation of 10 or 11 cm., but this is only done with serious injury to the mother, even if the cervix be effaced. The best known are the Bossi and the Dewees. The latter is the less dangerous of the two, as its blades are broader and free from the knife edge flare of the Bossi blades.

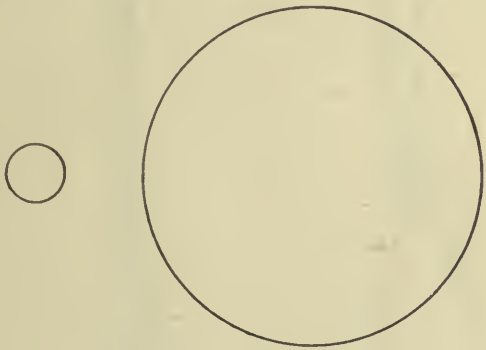


FIG. 202.—Actual caliber of the smallest and one of the larger Hegar bougies, showing the amount of dilatation procurable. (*American Textbook of Obstetrics.*)

The technic is the same as the two-bladed dilator; but the instrument is incomparably more powerful, and much more dangerous. Nothing is gained by using the more complicated multiple bladed dilators, as the danger of laceration is not diminished by the many extra points of contact. It is safe to dilate, to 7.5 cm. with a two-bladed and 5 cm. with a four-bladed dilator, provided the dilatation is done slowly. Beyond these limits, severe lacerations are certain.

II. **Manual methods** are very hard physical work, unless the cervix is effaced, soft and already fairly well dilated.

Unless the cervix is effaced, satisfactory manual dilatation is almost impossible.

Indications.—(1) Placenta prævia, as a step in delivery by podalic version.

FIG. 203.—Author's dilator, closed and open. It is designed to permit a transverse dilatation of 7.5 cm., the limit of safety. The shank of the screw wheel shows the amount of separation of the blades.

(2) Any need for rapid delivery, after the cervix is effaced and the os already fairly well dilated.

Contra-indications.—Ordinarily, rigid cervix, where the freedom from injury depends on slower methods of dilatation.

The manual methods are rapid, and to be used only when time is a factor and speed in dilatation is essential.

Methods.—1. *Harris method* where one hand only is used. This is the method to be chosen in placenta prævia, or other indication for podalic version.

Technic.—(1) The patient is in the dorsal position, carefully cleansed and anesthetized.

(2) The entire hand is inserted in the vagina.

(3) The thumb and forefinger are inserted in the cervical canal, separated enough to introduce the third finger; then the fourth and finally the little finger.

(4) The stretching of the cervix is then finished over the knuckles. The method is a powerful one, likely to be followed by laceration.

2. *The Edgar method* is the better, except in placenta prævia, where the hand of the Harris method acts as a sort of tampon to minimize the bleeding. The Edgar method is a powerful one, the cervix can be rapidly dilated but it is much more efficient if the cervix be effaced.

Technic.—(1) The patient is in the dorsal position, carefully cleansed and anesthetized.

(2) Two fingers of the right hand, with the back of hand *up*, are inserted in the vagina, hooked in the cervix posteriorly (at six o'clock on the clock face) and the cervix pulled down.

(3) Two fingers of the left hand, with back of hand *down*, are inserted and hooked in the cervix anteriorly (at twelve o'clock on the clock face).

(4) By using the wrists and back of hands as a fulcrum, the cervix is dilated with the fingers, making pressure first at six and twelve o'clock, and then at three and nine o'clock. After the cervix is half dilated, pressure can only be made anteroposteriorly, as if it is attempted to make pressure laterally, the fingers will slip out of the cervix.

Lacerations are common, but on the whole, this is the quickest method of dilating the cervix, with a minimum of injury, provided the cervix is effaced. In both these methods there is

more risk of infection than with branched dilators, unless rigid asepsis be observed. They involve considerable handling, but are very efficient.

III. **Packing the cervix with gauze,** so that labor pains may come on and soften and efface the cervix, as a preliminary to more rapid dilatation is only useful when the cervix is so rigid that any attempt to dilate it would be sure to cause lacerations. The method can only be used when the necessary time can be allowed (12 to 18 hours at least), for pains to come on and effect the desired effacement.

IV. **Hydrostatic Methods.**—The use of a dilatable rubber bag, distended with water under pressure, would seem at first the ideal way to dilate the cervix. Theoretically, it approximates more closely than any other, the natural method, with the amniotic sac. Practically it has disadvantages: (1) The pressure is constant, instead of intermittent, and the cervix is always made edematous, so that the final one-third of the dilatation is done at the expense of tearing; (2) the bags require considerable handling to insert them, with the attendant risk of septic infection; (3) they are liable to slip out of the cervix, and require repeated reinsertion; (4) they are prone to leak and thus become useless; (5) those that extend into the uterus, like the Voorhees, tend to displace the presenting part and cause serious errors of presentation; (6) if left in place several hours, they become foul, and therefore dangerous. Their use is indicated where there is need for fairly rapid, even dilatation of the cervix, but where immediate delivery is not essential.

All bags are sterilized by boiling, tested before use to detect leaks, their capacity is noted, and they are rolled on their long axes and lubricated with sterile glycerin, and inserted in the cervix held in the grasp of a pair of placental or Champetier de Ribes forceps.

All patients are in the dorsal position and cleansed with extra care. Anesthesia is necessary in all primiparæ, and not as a rule in multiparæ. The cervix must be naturally or artificially

dilated to admit about three fingers, before the bag can be inserted. The bag is inserted by putting two fingers of the left hand in the cervix (steadied by a double tenaculum in the hands of an assistant), and the bag, grasped in placental forceps, screwed rather than pushed in the cervix. The placental forceps are removed, the bag held in place between the two fingers in the cervix, while being filled. Sterile water is used to fill them, *never* air. The filling syringe is best a metal piston syringe, with a capacity of 150 mils.

These points apply to all bags and are stated here to avoid repetition.

Technic.—1. *Barnes* or *violin-shaped bag* is now practically obsolete. It is inserted so that the external os corresponds to the indentation on the side of the bag.

2. *Voorhees conical bag* is used mostly in the induction of labor. The medium size is the most useful.

(1) The cervix is grasped with a double tenaculum and held by an assistant.

(2) The bag is inserted in the cervix, and held in place with the fingers until too well distended to slip out. It is filled fairly tense with sterile water or lysol solution (*never* air) and two knots are tied in the tube, one inch apart, to hold the water in. Water will leak past a single knot.

(3) The vagina is packed with gauze around the tube, but the tube itself hangs outside the vulva.

(4) The patient is put back to bed and the nurse instructed to pull on the tube for one minute every ten minutes until it comes through the cervix, when it is allowed to collapse and is removed. This traction tends to elongate the cervix, instead of effacing it, and the method has the danger of laceration common to all bags.

3. *Hirst hour-glass* or *spool bags* are the best of all the bags for moderate dilatation. The hour-glass bag is used when the cervix is effaced, the spool bag when it is not effaced. The medium size, with a transverse diameter of three inches, is the best for general use. The method of insertion is that of the

FIG. 204.—Various types of balloon dilators: *a*, *b*, Voorhees'; *c*, Carl Braun's colpeurynter; *d*, Barnes'; *e*, Hirst's; *f*, Champetier de Ribes'; *g*, air pessary; *h*, Pomeroy's; *i*, bougie (end is closed.) (*De Lee.*)

Voorhees bag, but this bag does not disappear inside the cervix, and the uterine portion does not project far enough into the uterine cavity seriously to affect the position of the presenting part. It is inserted so that the external os corresponds to the constriction in the hour-glass bag, or the cervical canal to the shank of the spool in the spool-shaped bag. It is filled with water until tense, and extra water must be added every half hour. This can be avoided by attaching the bag to a water bottle and this in turn to a blood-pressure apparatus. The pressure in this case is kept at 180 m.m.; and in either case the bag is removed in four to six hours. Its only disadvantage is that it slips out of the cervix rather easily and must be watched, and it shares, with all the bags, the danger of laceration during the completion of the dilatation.

4. The *Tarnier balloon* and the *Braun metreurynter* are spherical, and more used for making pressure in the vagina in cases of prolapsed cord, while waiting for normal dilatation of the cervix, than as cervical dilators. When used for the latter purpose, they slip entirely inside the cervix, dislodge the presenting part far more than the Voorhees bag, and have no superior dilating power.

5. *Champetier de Ribes bag* is an enormous conical bag, with a limit of dilatation greater than the normal complete dilatation. It is inserted in the cervix, fully distended with water, and then gradually pulled through the cervix. It has no advantage over the lighter Voorhees bag, which was modeled on it, and has the disadvantage of excessive size.

6. The *Pomeroy bag* is a large double bag, consisting of a cervical and vaginal portion, and designed to dilate the entire genital canal, from internal os to vulva. It is inserted in the cervix, and held in place while the cervical (upper) bag is filled to hold it in place. The larger vaginal bag is then filled, and both outlet tubes clamped with hemostats. In twenty to thirty minutes, if extra water be added to keep up the tension as the cervix yields, the cervix can be completely dilated and the child extracted with forceps or by version.

It is a very powerful instrument, can inflict extensive lacerations, and its use should be confined to multiparæ with an effaced cervix, and preferably in a breech presentation. In primiparæ the danger of lacerations is too great to justify its use, except in emergencies.

After-care of Bags.—After use, the bags should be washed with soap and water, the cavity rinsed out with plain water, followed by alcohol. The outside of the bag is dried and powdered. They are kept in boxes in an even cold temperature. By this their life may be prolonged, but, at best, they must be discarded after six or eight months. They cannot be repaired, once they begin to leak or crack.

V. **Forceps.**—To put forceps on the child's head, through a partly dilated cervix, and by traction on the head complete the dilatation is bad obstetrics. The only justification is when there is urgent need for immediate delivery, as in failing compensation or acute dilatation of the heart. It is frequently necessary, however, to apply forceps, when the cervix is three-quarters dilated and well effaced. Here the head should be held steady and the cervix pushed back over it. The only difficulty will be with the anterior lip, which should be cut if it does not yield easily. This method is much safer for the child, than to effect the dilatation solely by traction.

VI. **Incision of the cervix** is indicated when: (1) extreme rigidity; (2) urgent need for rapid delivery.

Methods.—(1) Anterior vaginal hysterotomy (vaginal cesarean section), described in its proper place; (2) Dührssen's multiple incisions; (3) single incision of the edematous anterior cervical lip, which does not yield easily, though dilatation be rather far advanced. Dührssen's incisions are made up to the vaginal vault, with blunt-pointed scissors. Bandage scissors are very useful for the purpose. If the cervix be considered as a clock face, the incisions are at two, four, eight and ten o'clock. The child is extracted by forceps (version is always risky unless the cervix be fully dilated) and the placenta

expressed. Bleeding is usually profuse, but can be controlled by one stitch at the upper angle of each cut, but unless the patient's condition forbids it, complete suture of the wounds is advisable, using interrupted sutures of number 3 forty-day chromic catgut.

The condition of the cervix governs largely the choice of methods of delivery, and the choice of the proper method requires considerable skill and experience. The slower methods are always safer, provided the condition of the patient permits the necessary delay.

THE FORCEPS

Historical.—The invention of the obstetric forceps is generally credited to Peter Chamberlen, and the date about

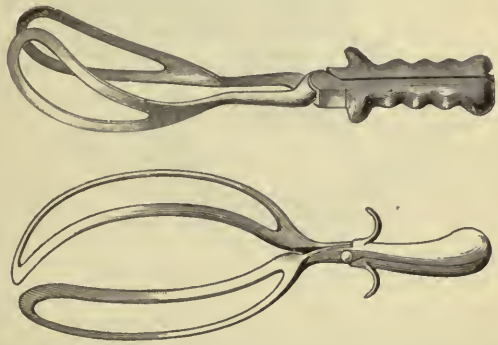


FIG. 205.—The Simpson forceps, best for general use. The light Hale-Sawyer forceps, for use at the outlet only. (*American Text-book of Obstetrics.*)

1616. The instrument was kept as a family secret in the Chamberlen family, and four different models finally found in the Chamberlen house in Essex, in 1813. About 1750, Smellie in England and Levret in France independently devised a similar instrument. The Simpson forceps in use today is a direct descendant of Smellie's; the Hodge forceps, from Levret's.

The **forceps** consists of two blades, called right and left, referring to their position in the maternal pelvis. Each blade has a handle and attached finger piece for traction. The blades are fenestrated. The instrument has a cephalic curve, to fit the sides of the child's head, and a pelvic curve, to fit the curve of the sacrum.

The best forceps for general use is the **Simpson.** This can be used at any point in the pelvic canal. For the pelvic outlet, where a very light forceps answers every need, the **Hale-Sawyer** is most useful. For application of the axis-traction principle, the best is the **Dewees** axis-traction forceps. These

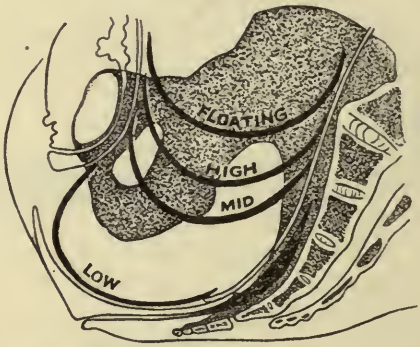


FIG. 206.—Application of forceps.

three answer every requirement for any point of application.

Functions of the Forceps.—(1) *As a tractor*, its chief function.

(2) *As a rotator*, dangerous to the maternal soft parts unless the head is on the perineum and under the pubic arch. It is not justifiable to rotate the head with forceps until it has reached this position.

(3) *As a lever*, a use not justifiable. Pendulum motion of the head does not occur in the normal mechanism of labor, and the head should not be wrenched from side to side with forceps.

(4) *As a Compressor.*—A certain amount of compression is inevitable in every forceps delivery. It is reduced to a mini-

mum by a folded towel placed between the forceps handles. Deliberate compression to reduce the bulk of the head is only done at a great risk of cerebral hemorrhage or fracture of the skull.

Position of Application.—(1) *To the "floating head,"* when the head is not yet engaged in the pelvic inlet. Except in cases urgently needing delivery and as a sequel to artificial dilatation of the cervix, this position of application should never be considered.

(2) *High application*, where the head has engaged in the pelvis but is not yet past the superior strait.

(3) *Midplane application*, where the head has passed about half way between the pelvic inlet and outlet. This is the most frequent application.

(4) *Low or outlet application*, where the head is on the perineum and at the pelvic outlet.

Indications for Forceps.—(1) Uterine inertia; (2) rigid perineum; (3) moderate contraction of the pelvis, where delivery is possible; (4) moderate overgrowth of child, where delivery is possible; (5) any condition requiring rapid delivery, where the cervical dilatation is sufficient; (6) where the child's heart sounds become progressively slower. Good general rules are the following: (1) Where with fairly active pains, progress ceases in the second stage of labor, for over two hours; (2) where the child's heart reaches 110 or less, at two estimations several minutes apart, and not during a pain; (3) any complication in the second stage of labor, threatening the life of either mother or child, and demanding prompt delivery.

Contra-indications are just as important as, or even more important than, the indications.

(1) The cervix must be completely dilated, or so nearly so that the completion of dilatation offers no difficulty. There is no better way of causing severe lacerations, with subsequent cystocele and prolapse of the uterus, than traction with forceps applied through a partially dilated cervix.

(2) The membranes must be ruptured.

(3) The head must be engaged in the pelvis. There are exceptions to this, notably placenta prævia, when the head can be pulled down to act as a tampon to check the bleeding.

(4) There must not be impossible disproportion between the head and the pelvic cavity.

(5) Forceps must not be used where there is an impossible presentation, such as face or brow presentation with the chin posterior.

(6) The forceps must not be used in hydrocephalus.

(7) A dead child should not be delivered with forceps. Craniotomy is better for the mother. But in all cases of doubt, use the forceps.

Conditions for the Use of the Forceps.—(1) Delivery must be possible, and not obstructed by too great a disproportion between the child's head and the pelvic canal, nor by an impossible presentation.

(2) If possible, an accurate diagnosis of the position of the head must be made, by noting the relation of the sagittal suture to the oblique diameters of the pelvis, and the position of the anterior and posterior fontanels. In case of doubt, feeling for the child's ear often clears up the diagnosis of position.

(3) The cervix must be completely dilated, or very nearly so.

(4) The membranes must be ruptured.

(5) The bladder must be empty.

(6) The forceps must be applied according to the diagnosis of position.

(7) In cases of contracted pelvis, the forceps may be used as a test instrument, to see if the head can come through.

Methods of Application.—(1) *Cephalic*—to the sides of the child's head, after an accurate diagnosis of position has been made. This is always to be done if possible, and in this position the forceps inflict a minimum of injury. The for-

ceps when applied should grasp the head just anterior to each ear, the fenestra corresponding to the child's cheek.

(2) *Pelvic application*—where the forceps are applied to the head, in the transverse diameter of the pelvis, regardless of the position of the head. This is to be avoided, if possible, as the forceps are liable to slip and the child is sure to be injured.

Pelvic application is correct in occiput in the hollow of the sacrum and where the head is distending the perineum with the occiput anterior, as in these cases the two applications

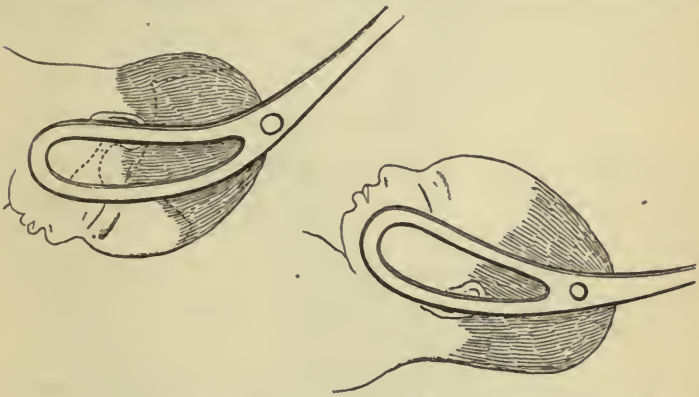


FIG. 207.—Forceps properly applied to the sides of the child's head, with the occiput anterior and posterior.

coincide. The forceps must always be applied with the "front" (the side of concavity of the pelvic curve) away from the perineum. Otherwise when the head rotates, the forceps will be upside down, and when the handles are elevated, the tips of the blades will cut into the rectum.

Preparation of Patient and Preliminary Steps.—The patient is best arranged on a kitchen or operating table, in the dorsal position, with the knees held back by a twisted sheet leg-holder. The ordinary bed is too low for a proper direction of traction, unless the operator sits on the floor. The table minimizes the difficulty of the operation. Forceps should

never be applied without consent. An anesthetic is always to be used, unless the patient's condition forbids its use (heart disease) or in a multipara with a relaxed perineum, where only the short outlet forceps are to be used. The pubes and vulva are shaved, and the vulva and vagina thoroughly cleansed with tincture of green soap, hot water and cotton or gauze, as for any vaginal operation. The bladder and rectum must be empty. Except for the outlet application, the dorsal position is much the best. Outlet forceps can be applied in the lateral position. The forceps are boiled, and the common fault of sterilizing only the blades and not the handles is to be avoided. Just before insertion both surfaces of the blade are lubricated with sterile glycerin.

Application of Forceps in the Different Positions

General Technic of Application of Forceps.—(1) Consent should always be obtained; (2) the left blade is always (or nearly always) inserted first; (3) that blade is rotated which corresponds to the oblique diameter of the pelvis in which lies the sagittal suture; (4) the patient must be catheterized.

Left Occipito-anterior Position of a Vertex Presentation.—*Diagnosis.*—(1) The head is presenting; (2) the sagittal suture is in the right oblique diameter; (3) the large fontanel is posterior, on the patient's right, near the right sacro-iliac junction; (4) the small fontanel is anterior, on the patient's left, near the descending ramus of the pubes.

Application.—(1) Two fingers of the right hand are placed in the vagina; (2) the fingers are passed far enough back to feel, if possible, the rim of the cervix; (3) the left blade of the forceps is grasped, like a pen, in the left hand; (4) the blade is inserted, with the handle held high up, and allowed to enter the vagina almost by its own weight. As it enters the handle sinks. The blade is slightly rotated outward (away from the middle line) so as to lie flat along the curve of the sacrum, and passed into position *between the cervix and the child's head;* (5) two fingers of the left hand now replace those of the right hand in the

vagina, and the right blade is grasped in the right hand and inserted similarly to the left and almost on top of it; (6) the right blade is rotated, by the two fingers inside the vagina and not by the handle, across the child's face into position on the right side of its head; (7) the handles will move back in position. If they will not quite lock, the handles are slightly

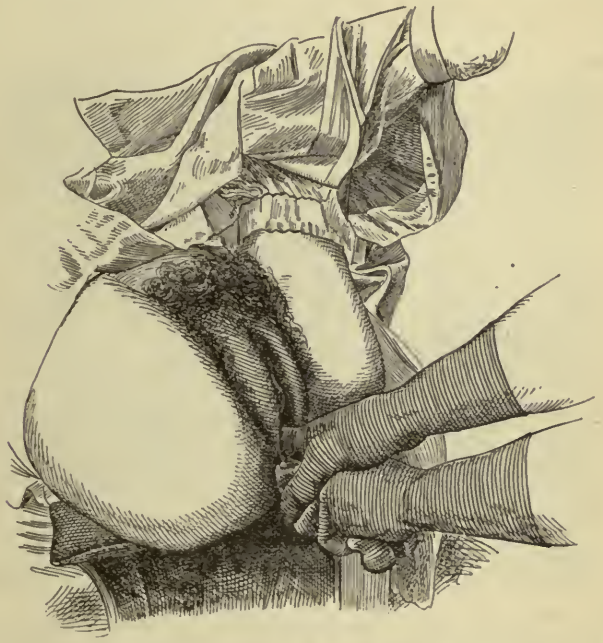


FIG. 208.—The proper grip on the forceps, while the head is still in the pelvic cavity and not on the pelvic floor. (*B. C. Hirst.*)

depressed, and the right blade then slips a little farther around; (8) a folded towel is placed between the handles, to prevent compression of the head, and the ends of the towel wrapped around the handles, to protect the operator's hands; (9) traction must be made moderately, in a direction obliquely downward, using only the biceps and not all the force the operator

is capable of; (10) pull in a way simulating labor pains, for a minute and then a rest of one or two minutes, allowing the forceps to spring apart; (11) traction is made by the first and middle fingers of the right hand over the shoulders on the handles, and *not* at the lock. The other fingers of the right hand maintain the proper compression around the handles. The left hand is fixed over the right, with the middle finger outstretched and the tip against the child's scalp, to detect slipping of the forceps; (12) when the head is under the pelvic

FIG. 209.—The proper grip on the forceps, when the head is under the pubic arch, and distending the perineum. At this point, no outward traction is made. (*De Lee.*)

arch, the forceps' handles begin to move upward. From this point the handles describe a curve corresponding to that of the pelvic canal. The operator changes his position, to the side of the patient, and merely lifts on the forceps, and *does not pull outward.* The perineum is protected by the free hand, as in a normal labor, and if much overstretched, episiotomy is useful. This part of the delivery must not be hurried, and as the head is born, the forceps handles should be lying flat on the

mother's abdomen. The rest of the delivery is like a normal labor.

Right Occipitoposterior of the Vertex.—*Diagnosis.*—(1) The head is presenting; (2) the sagittal suture is in the right oblique diameter; (3) the large fontanel is anterior, to the patient's left; (4) the small fontanel is posterior, near the patient's right sacro-iliac junction.

Application of the Forceps.—(1) Two fingers of the right hand are placed in the vagina, if possible the tips between the cervix and the child's head; (2) the left blade of the forceps is grasped and inserted as in L. O. A. and passes into position along the left side of the child's head; (3) the right blade is inserted as in L. O. A. and rotated, by the fingers internally, *over the occiput* into position along the right side of the child's head; (4) the same method of traction is employed as in L. O. A. except that the head is brought down on the pelvic floor in its original posterior position, and no attempt is made to rotate it as it comes down; (5) the head is now rotated, by the forceps, to the anterior position; (6) as the forceps are now upside down, they must be removed and reinserted as described in the next paragraph for R. O. A. They can be shifted without removal, but this is difficult and it is safer to remove and reapply them; (7) the rest of the delivery is then completed as described in L. O. A.

Right Occipito-anterior Position of a Vertex.—*Diagnosis.*—(1) The head is presenting; (2) the sagittal suture is in the left oblique diameter of the pelvis; (3) the large fontanel is posterior, near the mother's right sacro-iliac junction; (4) the small fontanel is anterior, on the mother's right.

Application.—(1) Two fingers of the right hand are inserted as already described; (2) the left blade is inserted into position along the sacrum and must then be rotated to its final position alongside the left side of the child's head (anteriorly); (3) the right blade is then inserted, and occupies its proper position without rotation; (4) the delivery is then completed as described in L. O. A.

Left Occipitoposterior Position of a Vertex.—*Diagnosis.*—(1) The head is presenting; (2) the sagittal suture is in the left oblique diameter; (3) the large fontanel is anteriorly, to the mother's right; (4) the small fontanel is posteriorly, toward the mother's left sacro-iliac.

Application.—(1) Two fingers of the right hand are inserted as already described; (2) the left blade is inserted posteriorly and then rotated to its proper position anteriorly, across the child's occiput, to the left side of the head; (3) the right blade is inserted, and occupies its proper place without rotation; (4) the head is pulled down as in L. O. A. but comes down with the occiput posteriorly until it is under the pubic arch; (5) the head is then rotated anteriorly, which turns the forceps upside down; (6) they are removed and reapplied as for L. O. A. and the delivery completed.

Occiput in the Hollow of the Sacrum.—*Diagnosis.*—(1) The head is presenting, and well down on the perineum; (2) the sagittal runs anteroposteriorly; (3) the large fontanel is anterior, under the symphysis; (4) the small fontanel is posterior, in the hollow of the sacrum.

Application.—(1) The left blade is inserted and falls naturally into position alongside the right side of the child's head; (2) the right blade is inserted and falls naturally into position along the left side of the child's head; (3) the forceps are transverse to the pelvis, yet the application is a cephalic one; (4) traction is made with the handles raised until the child's brow appears under the symphysis; (5) the operator stands to one side and depresses the handles until the face is born, supporting the perineum with his free hand; (6) the handles are then raised, and the occiput delivered. This position puts great strain on the perineum. Episiotomy is often needed to prevent severe laceration. Unless sure of the previous position, the head should not be rotated anteriorly, but delivered as it lies, although anterior rotation and delivery is a much less severe strain on the perineum.

Forceps with the Head at the Pelvic Outlet and Properly Rotated.—Here the head is as low down, the sagittal suture runs anteroposteriorly with the small fontanel anterior and the large one far posteriorly. Only the small Hale-Sawyer forceps should be used. They are applied the left blade first, and the blades slip naturally into position alongside the child's head, so that when applied, the forceps is transverse. This is also a position where the cephalic and pelvic applications of forceps coincide. *No traction is required;* the head is shelled out of the pelvic canal by an upward movement of the handles, in a continuation of the curve of the pelvic canal. All outward traction is to be avoided, as it will only do harm.

Doubtful Positions.—When the patient has been long in labor, there is usually such a large caput succedaneum that accurate diagnosis of position is very difficult or impossible. In such cases the hand may be inserted in the vagina and the entire head palpated. Feeling for the ear and noting its direction of facing will sometimes be of help. If no diagnosis of position can be made, and the forceps must be used, the instrument should be applied in the right oblique diameter, as most presentations are in this diameter.

Removal of Forceps.—When it becomes necessary to remove the forceps, two fingers of one hand should always be between the blade and the vaginal wall. The dull blade can cut the distended vaginal deeply, if this precaution is neglected.

Points of Safety and Danger in the Use of Forceps.—(1) An accurate diagnosis of position must be made, and the forceps applied accordingly.

Forceps of any kind should *never* be used until the bladder has been emptied by a catheter. The urethra will always be somewhat elongated, and a silk or linen or fairly large caliber soft rubber catheter is to be employed. Even if the head is very low down, the patient can always be catheterized by placing the finger of one hand between the head and the anterior vaginal wall, and with this finger guiding the catheter *upward and slightly forward* into the bladder. It should never

be trusted to the patient to void; the catheter is the only safe plan, and neglect of this may result disastrously.

(2) No traction must be made unless the blades will lock.

(3) Difficulty will sometimes be met in rotation of the blades, because the tip of the blade strikes the child's shoulder. This difficulty must be overcome by the fingers pressing on the blade internally, and never by forcing it around by the handle.

(4) A folded towel must always be between the handles, when traction is made, to prevent undue compression.

(5) Traction must be made simulating labor pains, allowing the blades to spring apart between pulls.

(6) The forceps must never be wrenched from side to side, nor must the handles be raised until the head is on the perineum.

(7) If the cervix is not completely dilated, the head must be held stationary with the forceps and the cervix pushed back over the head. Traction on an imperfectly dilated cervix is one of the best ways to tear it produce cystocele and later prolapse of the uterus.

(8) *Never* continue pulling on the forceps, if it begins to slip. Reapply it properly or use another model, as if the forceps slips off, severe injury to the pelvic floor, bladder or rectum is almost certain.

(9) As the forceps causes partial correction of the normal flexion of the head, larger diameters are involved in its passage through the birth-canal, and laceration is much more likely than in a normal labor.

(10) Traction is made in a direction obliquely *downward*, until the head is on the perineum. For this the operator must be seated—on a chair if the patient is on an operating table; on the floor if she is on the usual low bed. Only the force of the biceps should be used. To brace the feet and pull with all one's strength is brutal and murderous. When the head is on the perineum, and the handles begin to turn up of their own accord, he must stand, to one side of the patient, and the forceps grasped at the lock with the little finger between the shanks of the forceps. *All outward traction is now abandoned;*

the head is lifted over the perineum and the forceps handles carried toward the patient's abdomen.

(11) When properly applied, on the average size head, the handles should be almost together. Wide separation of the handles indicates improper application or a very large head. As the head is born, the occipital protuberance should be just under the mother's urethra, and the forceps perfectly transverse.

(12) Plenty of time must be taken. In a primipara, the usual time for delivery in a mid forceps operation is thirty to forty-five minutes.

(13) Heavy forceps should never be used when the light Sawyer ones will do. At the outlet, unless the head is rotated in the hollow of the sacrum, only the Sawyer forceps may be used.

(14) The Sawyer forceps may be used with the patient lying on her side. The dorsal position is best for all other applications.

(15) Episiotomy, if done, should be as limited as possible; several short snips with scissors in the same line being better than a cut that is too long. Too extensive an episiotomy causes considerable pain for many months after convalescence.

(16) The child's heart sounds should be watched in all forceps deliveries, as it may be necessary to hurry delivery if progressive slowing of the heart shows asphyxia.

Forceps in Abnormal Presentations.—(1) In *face presentations*, the forceps had better be used as a rotator only. In posterior positions of the face, traction should never be made; in anterior positions traction is permissible, but risky, as sudden slipping is common.

(2) In *brow presentations*, the management is the same as in face presentation.

(3) In *breech presentation*, the forceps may be used to extract the breech, but there are better methods. The forceps is liable to slip off, severely injure the mother, and fracture of one or both of the child's femora or of its pelvis are common.

(4) Forceps may be required to extract the *after-coming head*. The child's body and arms are held up, the forceps applied to the sides of the head, and the head delivered by carrying the handles upward. Severe perineal injury is likely, unless episiotomy is done, but it is sometimes impossible to deliver the head in any other way. The Sawyer forceps should be used if possible, and the need for hurry in delivery is past when the face is born.

Prognosis of Forceps Operations.—*For the mother* the greatest dangers are severe laceration, hemorrhage and infection. The higher the application the greater the likelihood of injury. The cervix is often badly torn, cuts of the anterior vaginal wall, even involving the bladder, are not rare. The pelvic floor is nearly always more or less torn. The traction often causes rapid development of a cystocele or prolapse, even when no injury has been evident at the time of delivery. The pelvic joints, particularly the sacro-iliacs may be sprained or broken. Fraction of the coccyx is common. If the forceps slip all these accidents are intensified.

For the Child.—Asphyxia; compression of the skull with concussion of the brain; actual fracture of the skull; injuries to the eyes (bruising cataract, retinal hemorrhage, exophthalmos); injury to nerves causing ptosis or Bell's palsy; bruising and cuts anywhere on the scalp or face; cephalhematoma. Children born with forceps are much more liable to asphyxia and inspiration pneumonia. The forceps, properly applied, causes the risk to the baby to be at least trebled, over a normal labor. Improperly applied and used, it is murderous.

Axis-traction Forceps.—The principle of the axis-traction forceps is to make traction on the head downward and backward at the superior strait, coincident with the axis of the pelvic canal.

Models.—(1) The American forceps—Dewees—much the best of all; (2) the French model, the Tarnier; probably the one in most common use, but a bad instrument; (3) the German model—the Breus and (4) the English or Milne-Murray.

The axis-traction instrument is very powerful, and great damage can be done by its unskilled use. The Dewees forceps

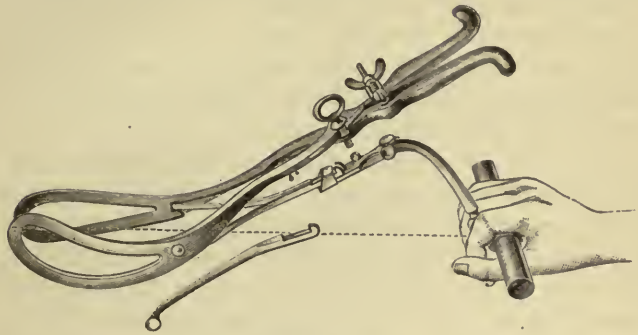


FIG. 210.—The Tarnier axis-traction forceps. (*American Text-book of Obstetrics.*)

has a fixed handle, and the traction is thereby applied at a proper angle. All the others depend upon bars attached half way up the blades, and unless the traction be applied

FIG. 211.—The Dewees axis-traction forceps. The least dangerous of these instruments.

with the rods widely divergent from the blades and handles, it is impossible even to approximate the proper line of traction.

The forceps should never be used unless the patient is on kitchen or operating table, and the Dewees instrument is the one least likely to do severe damage.

Indications.—(1) To secure engagement of the head in pelvis whose conjugate at the brim is not less than 8 c.m.; (2) in a case of hurried delivery, where the child must be extracted quickly.

Application.—In contracted pelvis, the head is lying to engage in the inlet, and lies transverse. If the forceps is applied transversely, one blade lies squarely over the child's face. This is not recommended. It is not practicable to apply them to the sides of the head, as by this the axis-traction principle is lost. The blades must be applied obliquely—one over the malar bone and the other to one side of the occiput. To do this, the blade must be rotated that corresponds to the oblique diameter in which the head will lie, after it enters the pelvis, always assuming that the occiput rotates anteriorly. For instance, if the head is transverse and the occiput to the left, the head will lie in the right oblique diameter after it enters the pelvis, and the right blade is the one rotated. After the forceps is in position and locked, traction is made, simulating labor pains, for not more than a total of seven or eight traction efforts. If this shows no advance, nothing is gained by continuing. The forceps should be removed and the patient delivered by version, cesarean section or pubiotomy. During traction, the perineum, with all *except* the Dewees instrument, must be protected by a Sims' speculum.

If engagement of the head is secured, three courses are open:

(1) Remove the axis-traction instrument and substitute the less powerful Simpson forceps—much the better plan.

(2) Complete the delivery with the axis-traction instrument.

(3) Remove the forceps and allow the patient to deliver herself—decidedly a bad procedure.

It is questionable whether the use of axis-traction forceps to secure engagement of the head is ever a justifiable procedure.

If the head cannot be engaged by proper traction—downward, of the Simpson forceps, it is unlikely that the greater force of the axis-traction forceps will succeed without injury to the child or to the maternal structures. The instrument, even the Dewees, is too powerful for safety, and its use is becoming, fortunately, less frequent. The author feels that a head which will not spontaneously enter the pelvic canal, should not be dragged in.

It is not advisable to try to use a makeshift instrument, with holes bored in the blades through which tapes are threaded, to make the necessary traction.

VERSION

This procedure means the changing of the position of the fetus from an unfavorable to a more favorable one, or for purposes of delivery It varies from a simple correction of flexion or position of the head to a complete reversal of the child (from head to breech or *vice versa*).

Indications.—(1) Occipitoposterior positions, to be rotated anteriorly at the superior strait; (2) face or brow presentations to be changed into a vertex; (3) breech presentations, to be converted into head presentations, by external manipulations alone; (4) transverse presentations, brought down by the breech (podalic version); (5) contracted pelves, with conjugate not under 8 cm., as an operation of choice; (6) any case requiring rapid delivery, where the cervix is dilated sufficiently, or is easily dilatable (such as placenta prævia).

Strictly speaking, version is turning of the child, so that the pole opposite the one originally presenting is brought down.

Contra-indications.—(1) A tetanically contracted uterus with a high contraction ring; (2) very firm engagement of the presenting part; (3) an impossible pelvis; (4) a gigantic child; (5) long-ruptured membranes, usually coincident with a tetanically contracted uterus; (6) an undilated cervix (for podalic version).

Methods.—(1) Postural, where errors of flexion may sometimes be corrected by the position of the patient; (2) external manipulation alone; (3) internal manipulation alone; (4) combined external and internal manipulation. Version is said to be *cephalic*, when the head is brought down, or *podalic*, when the foot is brought down.

Technic.—(1) Errors of rotation (persistent occipitoposterior) or errors of presentation (face or brow) may be corrected by arranging the patient in the dorsal position, preferably on a table, and under deep anesthesia. After proper preparation, the whole hand is inserted in the vagina, and aided by the free hand on the patient's abdomen, the head is pushed out of the pelvis and rotated into the desired position. For this complete dilatation of the cervix is essential, as the head will not remain in its new position unless pulled in the superior strait with forceps. The method is urgently needed in mento-posterior position of a face or brow; otherwise it is a matter of election, to be done only when difficulty is feared.

Cephalic version is most often required to change a breech to a vertex presentation. It is only possible before labor has begun, and with unruptured membranes and a uterus not prone to contract upon handling. It is done by external abdominal manipulation, pushing up the breech as the head is pulled down. Failures are common, and when successful, longitudinal pads and a binder are required to prevent, if possible, a return of the child to its original position.

Postural version is used to correct if possible errors of flexion, as in brow and face presentations. By turning the patient to one side or the other, it is possible, but not likely, that the presentation may be converted into a vertex.

Podalic version is most frequently indicated in transverse presentations. If the arm be prolapsed, it must be carefully cleansed and returned to the vagina. Before attempting podalic version, the cord should be palpated, to see if the child is alive or dead. If dead, decapitation is the proper procedure and *not* version. Podalic version must never be done if the

lower uterine segment is overdistended, with a high contraction ring, and the uterus tightly moulded around the child's body. Rupture of the uterus is sure, if version be done in such a case, and not unlikely even in a case apparently favorable.

Technic.—(1) The patient is arranged on a table, properly cleansed, and anesthetized.

(2) The prolapsed arm, if any, is cleansed and returned to the vagina. A fillet may be placed around the wrist and the arm thus prevented from returning into the uterine cavity.

(3) The hand which midway between pronation and supination corresponds with its palmar surface to the child's abdomen, is inserted into the uterine cavity.

(4) The anterior foot is sought and by traction on the foot and ankle, the child's body is turned around. In this procedure, it is important to see that the child is not brought down astride of its cord. It is not advisable to bring down both feet. One gives ample hold for traction; it is unnecessary to make prolonged uterine search for the other foot. Bringing down the anterior foot secures anterior rotation of the breech, and the other leg makes extra bulk for further dilatation of the cervix. But if the cervix is completely dilated, bringing down both feet often makes the delivery easier.

(5) As soon as the knee is outside the vulva, the operation of podalic version is completed. The case is then managed like an ordinary breech.

(6) Traction on the leg should be cautious and gentle. It is easy to fracture the child's femur. After every podalic version, the uterus should be examined for possible rupture, and it must be remembered that podalic version is not a safe method of delivery for the child, even when the cervix is completely dilated.

EXTRACTION OF THE BREECH

Indications.—(1) Where ample time has been allowed, and the breech is not yet on the pelvic floor, and progress has been arrested; (2) any condition in mother or child indicating hurried delivery.

It must be remembered that complete effacement, dilatation and paralysis of the cervix is essential for the safe delivery of the after-coming head. Delivery in a breech is a much more simple procedure when it has not been interfered with prematurely.

Methods.—I. *Decomposition*, where one leg is pulled down and used as a handle for traction.

Technic of Decomposition.—(1) The patient is arranged across the bed, with her hips over the edge of the bed, or better on a table.

(2) For primiparæ, anesthesia is necessary.

(3) After proper cleansing, one hand is inserted along the child's body, and the anterior foot is sought. The leg is bent at the knee and by traction the foot is delivered across the child's abdomen and pulled outside of the vulva, until the knee is born. The second leg is left alone, to add to the bulk of the breech, for efficient dilatation of the cervix.

(4) Too active traction is likely to fracture the femur. Decomposition is not possible if the breech is far down the pelvic canal. It is, when possible, much the best method, except when the child is dead.

II. *Manual Method.*—Applied in two ways: (1) Under anesthesia, the whole hand is inserted in the vagina, the child's breech is grasped with the index finger over the crest of one ilium, the ring finger over the crest of the other ilium and the middle finger outstretched along its spine. The position is very fatiguing and the method is of doubtful utility.

(2) One index finger is hooked in the child's groin, and traction is made, as with a hook. The direction of pressure should be toward the child's abdomen, and away from the femur, to lessen the danger of fracture. During traction, the wrist is supported with the other hand closed around it. As the operation is very tiring, the hands may be changed from time to time.

III. *The Fillet.*—This is a bandage, four or six inches wide, passed between the thighs, over the back and down again

between the thighs. The pressure must never be on the abdomen. It is a most efficient method, when once applied, but is exceedingly awkward to apply. The bandage is passed either with the hands, which is very difficult, or with a fillet carrier, like an enormous aneurysm needle. A fillet carrier with a sliding tip, like a Bellocq's canula, makes the application much easier, but in any case it is impossible without anesthesia.

IV. *The forceps* may be applied to the breech, but this is done with considerable risk of slipping, and danger of fracture of the pelvis or femur. If the forceps holds, the method is efficient.

V. *Blunt hook* is best confined to dead children or those where all other means to extract the breech have failed. It is a heavy steel hook, which is passed over the thigh at the groin, and by which the breech is drawn out. It is exceedingly efficient, but there is considerable risk of perforating the groin, and almost a certainty of fracturing the femur.

EXTRACTION OF THE AFTER-COMING HEAD

(1) **Wigand Method.**—Child astride of forearm, forefinger in mouth to maintain flexion, the child is carried up over the mother's abdomen, aided by suprapubic pressure on the head.

(2) **Mauriceau Method.**—Same as the Wigand except that the pressure on the head is infrapubic, under the symphysis, with the middle finger against the child's occiput. Care must be taken not to get the finger under the edge of the symphysis or a broken phalanx may result when the body of the child is carried upward.

(3) **Prague Method.**—The child is grasped by the feet, in one hand, and the fingers of the other hand placed over the neck. By using the whole body as a lever, the child is turned up over the mother's abdomen. This is a very powerful method, and likely to result in considerable perineal laceration.

(4) **Forceps.**—The body and arms are held up by an assistant. The forceps applied and the head shelled out by elevat-

ing the handles and not by traction. The forceps should always be ready for use, in any case of breech presentation or version, as it may be impossible to dislodge the head without them.

(5) **Deventer Method.**—The child is pulled straight down toward the floor, without previously disengaging the arms. This method is only possible in premature children, or in women with very large pelves and relaxed pelvic floor.

In all these methods, great force must not be used. There is danger of rupturing the cervical roots of the brachial plexus, fracture of the clavicle, fracture of the neck or even detachment of the head from the body. If moderate traction does not suffice, and the forceps will not dislodge the head, craniotomy is required. Nothing is gained by excessive traction, as the child is sure to be badly injured or killed. If sufficient force has been used to fracture the spinal column, and the neck suddenly begins to stretch alarmingly, all traction should cease and craniotomy be done. Otherwise the head will be pulled off —an accident for which there is no excuse, except in a dead, macerated child. If the head is detached, the neck should be caught firmly with a volsellum and the head delivered by craniotomy.

EXTRACTION WHEN THE CHIN IS ANTERIOR

If the chin is *anterior*, which rarely happens, the body is carried up if the chin is above the symphysis and the head extended; is carried *down* if the chin is under the symphysis with the head flexed.

EMBRYOTOMY

Embryotomy is a generic term, describing several different mutilating operations in the child. These are: (1) craniotomy; (2) decapitation; (3) amputation of extremities; (4) evisceration; (5) cleidotomy. The indications for all these naturally differ considerably.

Craniotomy

Indications.—(1) Where the child is dead, with or without a contracted pelvis; (2) impacted face presentation with the chin posterior (here the child is usually dead; if not, pubiotomy or extraperitoneal cesarean section is better); (3) hydrocephalus; (4) on the living child, it may be considered as a means of delivery when any other means is not available, but should be very rarely needed.

Technic.—(1) The patient is arranged in the dorsal position on a table, prepared as for any vaginal operation, and fully anesthetized.

(2) The child's scalp is caught firmly with a heavy volsellum, by which an assistant steadies the head.

(3) The skull is perforated through a fontanel, suture or bone, by means of a long-handled, sharp-pointed scissors. There are many special perforators made, the best of which is the Blot, but they are expensive and not as efficient as the scissors. Care must be taken to see that the perforating instrument enters the cranium, and is not deflected by the skull. This is much more likely to happen with the perforator than with scissors.

(4) The hole in the cranium is then dilated with an ordinary Wathen uterine dilator, to get room to insert the cranioclast. It is not necessary nor advisable to waste time washing out the brain. This will come out as the head is pulled upon.

(5) The Braun cranioclast is next inserted, the solid blade inside the skull, screwed moderately tight, so as to get a firm hold, and the head delivered as with ordinary forceps. If the instrument is screwed too tight, it will bite pieces out of the skull like a ticket punch, and if this occurs several times, it adds considerably to the difficulty by not leaving enough for a firm hold. Above all, it must be so applied that the cervix is not included in its hold.

(6) As soon as the head is delivered, the cranioclast is removed, and the perforator inserted into the medulla at the

foramen magnum. This is important particularly in hydrocephalus, as the child might breathe or even cry after birth.

(7) The rest of the body is then delivered as in any normal labor. If great difficulty be experienced with the shoulders, a blunt hook may be used in the axilla, or one or both clavicles cut.

(8) If craniotomy is done in a contracted pelvis, or if the child be very large, the cranioclast may not be able to extract it. In this case, the head must be crushed by a cephalotribe, of which the best is the Tarnier. The central spike is inserted in the head, and the heavy forceps applied transversely. The

FIG. 212.—Braun's cranioclast. (*American Text-book of Obstetrics.*)

head is then crushed and delivered. This instrument is expensive and not likely to be found outside of maternity hospitals. A fairly good substitute is the Tarnier axis-traction forceps, with the blades screwed as close together as possible.

If the cranioclast tears off once or twice, sharp spicules of bone are likely to protrude from the wound in the cranium. These should be looked for and removed, before the head is brought down. If the cranioclast fails, and no cephalotribe is available, the head may be delivered by two heavy volsella, taking firm grips of the bone and scalp, and applied one alternately above the other as the head is brought down.

Craniotomy is sometimes needed in the after-coming head. In this case the skull is perforated through the roof of the mouth or through the foramen magnum. With the head open, it can be delivered with forceps as it collapses. In these cases the body must never be cut away from the head, as the body is a very convenient handle, and if the head is freed, it usually retreats in the uterine cavity; the necessary craniotomy is

thereby made much more difficult. If this has happened, the stump of the neck is caught with a volsellum, the head thereby steadied, the skull perforated where it can be most easily reached, and the cranioclast inserted. The head is then extracted by combined pull on the volsellum and cranioclast, so that the neck is brought down first, to avoid tearing of the uterus and vagina by sharp edges of bone.

After every craniotomy, the uterus should be washed out, on account of the amount of handling necessary, and examined for possible injury.

Decapitation

Indications.—Shoulder presentation, impacted, with high contraction ring and a dead child. If the child is alive, and in good condition, and the contraction ring is so high that podalic version is not to be considered, cesarean section should be done. The diagnosis of the child's condition is made by palpation of the cord, under proper aseptic precautions.

Technic.—(1) The patient is arranged on a table, in the dorsal position, properly cleansed and anesthetized.

(2) If the arm is prolapsed, it is cleansed, wrapped in wet sterile gauze, a fillet is put around the wrist and the arm is *not* replaced in the vagina.

(3) The entire hand is placed in the vagina, and two fingers locate the neck.

(4) The head can be amputated by a Braun hook, sharp on the inside, or a Ramsbotham sharp sickle-shaped knife, or a wire saw.

These methods are not necessary, much the best way is as follows: A piece of heavy string (fish line) or umbilical tape, three feet long, is boiled. A small loop is made in one end, and this loop slipped over the end of the middle finger. The whole hand is inserted, the fingers carried over the neck *from behind*, reaching as far around the neck as possible. The finger is then worked out of the loop, leaving the string in situ. The fingers then reach around the neck from *in front*, the loop is caught and the string pulled around the neck and outside the

vulva. The neck is now sawed through, with the greatest ease and rapidity, the spinal column offering no obstacle. This method is infinitely quicker, easier and neater than any other.

(5) When the head is severed, the body is delivered first by traction on the prolapsed arm. It is impossible to deliver the head first, and no attempt should be made to do it.

(6) The whole hand is inserted in the uterus, the head grasped by putting two fingers down the mouth, the thumb on the stump of the neck. The head is brought through the inlet in an oblique diameter, aided by suprapubic pressure, rotated anteriorly and delivered. If the pelvis is contracted, the head may have to be crushed, but this is very rarely necessary. After the placenta is extracted, the uterus should be examined for possible rupture, and the cavity thoroughly douched with lysol solution, 1 dram to 2 pints, on account of the excessive handling.

Amputation of Extremities

This is necessary only in monsters. The arms and legs are removed with scissors, until the bulk of the child is reduced sufficiently to permit its delivery.

Evisceration

This is required only in monstrosities or in unusual presentations, such as abdominal, where the child is dead. The abdomen and chest are opened with scissors, the thoracic and abdominal contents removed manually, the back broken and the child delivered if necessary by morcellation.

Cleidotomy

Cleidotomy or cutting of the clavicles is not often required.

Indications.—(1) Impacted shoulders, in very large children, after delivery of the head; (2) after craniotomy; (3) in anencephalic monsters, who often make up, in breadth of shoulders, what they lack in head.

Technic.—(1) The head is pulled downward, to put the neck on a stretch, but if the child is alive, not sufficiently to endanger

the cervical roots of the brachial plexus; (2) the *anterior* clavicle is located and with scissors is cut about its middle. It is rarely necessary to cut both; (3) after delivery, the skin wound is sutured and the case treated as one of fractured clavicle.

Theoretically there is some danger of injury to the cervical roots of the brachial plexus and the subclavian artery. Practically, as the shoulders are compressed in the pelvic canal, the clavicles are bowed outward, away from the vessels and nerves, so the danger is not great, with reasonable care.

SYMPHYSEOTOMY

Symphyseotomy (often called Sigault's operation) is the cutting of the symphysis, to allow expansion of the pelvis and vaginal delivery of the child. Its one time popularity was due to the high mortality of cesarean section, in the pre-antiseptic days, and has been waning since the improvement in the methods in cesarean section. The operation is contra-indicated in pelves whose conjugate is less than 7.5 cm. at the brim. If section of the pelvis be desired, pubiotomy is better.

Indications.—(1) As an elective operation in contracted pelves whose conjugate is not less than 7.5 cm., (2) in transversely contracted pelves whose transverse of the outlet is not less than 6 cm.; (3) in cases of impacted face presentations with the chin posterior, where the child is alive.

Technic.—(1) The patient is prepared both for abdominal section and plastic operation, arranged in the dorsal position and anesthetized.

(2) A small incision is made just above the symphysis (Italian method and the best) or over the joint (French).

(3) The pubic attachment of the recti is then cut transversely, enough to get one finger behind the symphysis.

(4) A metal catheter is passed into the urethra and by downward pressure the urethra is held out of the way.

(5) A curved Galbiati knife is passed under the symphysis and the joint severed. Usually the subpubic ligament must be severed separately.

(6) The very free hemorrhage, from the crus clitoridis, is checked by packing the wound with sterile gauze.

(7) The patient's pelvis is supported by assistants, and the child's head is drawn slowly through the pelvis by forceps, or the case is left to nature. The latter is the safer plan.

(8) As soon as the child is delivered, the patient's thighs are brought together.

(9) The wound is explored with the finger, after the packing is removed, to see that the bladder is not nipped between the edges of the cut bone.

(10) It is not necessary to wire the symphysis.

(11) The wound is closed with silkworm-gut sutures, and the pelvis supported by a broad adhesive strap, encircling it.

After-care.—The after-care is difficult and troublesome. The patient's pelvis is kept immobilized by adhesive straps or a laced canvas binder, and she must lie on a mattress free from sagging, or on a Bradford frame.

Dangers.—(1) Hemorrhage, from the vesical plexus and the crus clitoridis; (2) injuries to the bladder and sacro-iliac joints during delivery; (3) non-union of symphysis; (4) infection of wound.

After the vaginal work has been completed, the symphyseal wound is handled only with fresh sterile instruments and fresh gloves.

PUBIOTOMY (HEBOTOMY; HEBOSTEOTOMY; EXTRAMEDIAN SYMPHYSEOTOMY)

If the pelvis is to be cut, this is the better operation. The principle is cutting the pubis, midway between the symphysis and obturator foramen, on the side on which the child's occiput is, and preferably allowing nature to finish delivery, rather than terminate the labor by forceps.

Indications.—(1) As an elective operation in contracted pelves, whose diameters are not less than 7.5 cm. conjugate or

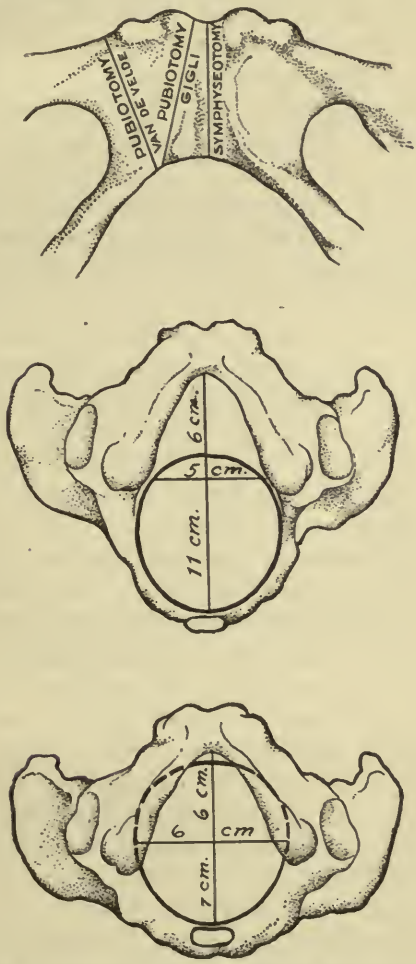


FIG. 213.—Line of section in symphyseotomy and pubiotomy and the type of pelvis in which these operations are indicated.

6 cm. transverse of the outlet; (2) impacted face, with chin posterior, and a live child.

Technic.—(1) The patient is prepared as for abdominal section, and also for vaginal delivery, arranged in the dorsal position, and anesthetized.

(2) A small incision is made just outside the pubic spine, on the side on which is the child's occiput.

(3) A large Döderlein needle, with a hook instead of a point, is passed around the bone, hugging it as closely as possible.

(4) The labium on the same side is pulled as far as possible across the vulva, to allow the point of the needle to emerge as far as possible from the vulvar orifice. The skin is nicked and the needle emerges.

(5) A Gigli wire saw is attached to the needle, and pulled back along the track through which the needle passed.

(6) The bone is sawed through, with the saw as near in a straight line as possible (to prevent breaking). At this point there is profuse bleeding from the crus clitoridis, and the wound may have to be packed and vaginal counterpressure applied by a gauze sponge held in a clamp.

(7) The bones separate immediately about 2 cm., as the head passes through the pelvis this increases to 4 cm. or over.

(8) The head may be delivered with forceps, or allowed to descend naturally, this latter plan minimizing the risk of tearing through into the vagina. The patient's pelvis must be supported in either case, to avoid injury to the sacro-iliac joints. Version is to be avoided.

(9) As soon as the child and placenta are extracted, the patient's thighs are approximated; with fresh gloves the small wounds are sutured and dressed, and the pelvis is immobilized with adhesive straps. Catheterization will show injury to the bladder, if any.

(10) The after-treatment is that of symphyseotomy.

Dangers.—(1) Hemorrhage, from the crus clitoridis; (2) extensive hematomata, which are prone to become infected; (3) lacerations through into the vagina, during delivery—a serious accident because of the danger of infection; (4) injuries

to the bladder, causing urinary infiltration of the prevesical space; (5) injury to sacro-iliac joints.

The patient is usually able to leave her bed and walk in the fourth week—much sooner than in symphyseotomy.

Prognosis.—An average maternal morbidity (fever, hematuria, etc.) of 40 per cent. A maternal mortality of 4.9 per cent. and a fetal mortality of 10 per cent. After symphyseotomy there is usually some permanent enlargement of the pelvis. This does not occur after pubiotomy, and the callus formation has proved a further obstruction in subsequent labors. Symphyseotomy may not be done twice. Pubiotomy can be repeated but preferably not on the same side, and cesarean section is better.

ANTERIOR VAGINAL HYSTEROTOMY (HYSTEROSTOMATOMY; VAGINAL CESAREAN SECTION)

Principle.—Incision of the cervix and lower uterine segment, anteriorly in the middle line, through the internal os, after adequate separation and adequate protection of the bladder.

Time of Operation.—Unnecessary prior to the third month; dangerous after seven and one-half months, because of the risk of tearing the bladder, but between three and seven and one-half months, it is the best operation rapidly to empty the uterus, with a minimum of shock.

Indications.—(1) Any condition requiring rapid delivery between the third and seventh month of pregnancy, especially where the cervix is uneffaced and undilated; (2) intractable rigidity of the cervix.

Anesthesia is preferably general. In any case up to the fifth or sixth month, local infiltration anesthesia answers perfectly, but after this date, the traction on the child to secure delivery is such as to make general anesthesia desirable. If the patient's condition contra-indicates general anesthesia, local anesthesia will prove satisfactory at any time.

The **local anesthetic** is best ¼ of 1 per cent. (1–400) novocain solution to each ounce of which 10 drops of 1–1000

adrenalin solution has been added. This solution can be used in large quantities as it is practically non-toxic. Failing this solution, 2 per cent. β-eucain or 1 per cent. cocain solution may be used, but much more sparingly. The best syringe is a Record or all-glass Luer syringe, of 10 mil capacity, sterilized by boiling. The points of injection are: (1) Anteriorly under the bladder; (2) to either side of the cervix (at three and nine o'clock); (3) straight into the cervical muscle, parallel to the canal, at three and nine o'clock. The operation may be begun two or three minutes after the injections are completed.

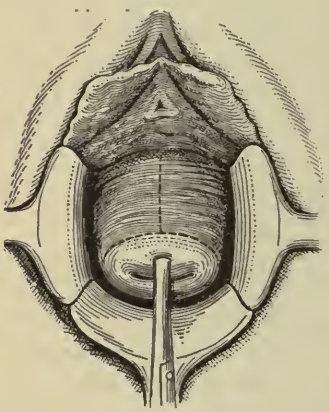


FIG. 214.—First incision, in the vaginal mucosa, to separate the bladder. The first step in anterior vaginal hysterotomy. (*Peterson.*)

Technic.—An operating table, good light, proper instruments and ample assistance are essential. Failing these, the operation is better not undertaken, above all *not* in placenta prævia.

(1) The patient is arranged in the dorsal position on a table, carefully cleansed, and anesthetized.

(2) The cervix is caught at each side with a lion-jawed volsellum, and the perineum retracted by a weighted Auvard speculum.

(3) A longitudinal incision is made, on the anterior vaginal wall, through the mucosa, from near the urethral orifice to the vaginal attachment at the cervix. A transverse incision is made across the anterior lip of the cervix, at the attachment of the vaginal mucosa, meeting the lower end of the longitudinal cut at right angles, like an inverted T.

(4) The mucosa is caught on each side, with a hemostat at the angle formed by the two incisions, and is dissected off the bladder.

(5) The uterovesical ligament is cut, and the bladder is pushed up, by blunt dissection by the forefinger, protected by sterile gauze, until the peritoneal reflection is reached.

(6) A vaginal retractor is then passed under the bladder, to protect it, taking care not to push the point high enough to break through into the peritoneal cavity.

(7) The cervix is now pulled strongly downward, by the volsella attached to it, and is incised by straight heavy scissors, in the middle line, through the internal os. It is essential that the incision be in the middle line and it is very easy to deviate to one side, unless care be used.

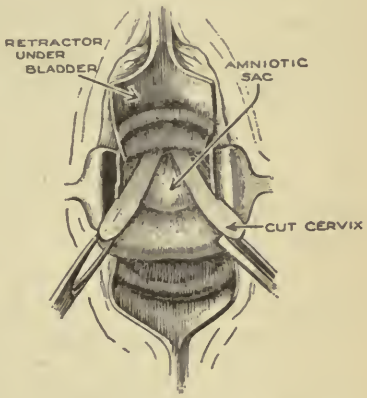


FIG. 215.—Vaginal cesarean section. The site of the incision in the cervix.

(8) The child is now extracted by placental forceps, ovum forceps, miniature Simpson or full size forceps, depending upon the date of pregnancy. As soon as the cervix is cut, the anterior retractor is in the way and should be removed, especially if the pregnancy has passed the fifth month.

(9) The placenta is extracted, and the patient is given, hypodermically, two ampules of aseptic ergot and one ampule of pituitrin.

(10) The uterus is washed out with sterile water.

(11) The uterine cavity is packed with a gauze strip, even though at the time it seems firmly contracted and not to need packing.

(12) The cervical wound is closed, by interrupted stitches of number 3 chromic catgut. The first stitch is placed about the middle of the wound, and using this as a traction stitch, the higher stitches are put in, and then those in the lower half of

the wound. The vaginal retractor under the bladder is again needed, until the upper half of the cervical wound is closed. Care must be taken not to pass any stitch through the packing.

(13) The vaginal mucosa is now sewed back in place, where it belongs. The portion of the longitudinal incision just above the cervix is not sutured, but left open for drainage, and a small strip of packing put under the bladder. If this precaution be neglected, an enormous hematoma may form.

(14) The vagina is packed with sterile gauze, and the patient returned to bed.

(15) A note is made on the chart that three pieces of packing are to be removed and accounted for.

(16) Twenty-four hours later, the packing is removed, and the uterus washed out with sterile water. If the placenta has been removed entire, there should be no occasion to explore the uterus with placental forceps. In case of doubt, this should be done.

(17) The after-care and convalescence is that of the ordinary plastic operation.

A contra-indication to this operation is placenta prævia, due to the danger of hemorrhage and infection. In any case the operation is not an easy one and is not to be undertaken lightly. If done after the seventh month of pregnancy, the danger to the bladder is very great, and the vesicovaginal fistula is always at a situation most awkward to repair. Unless the lowest stitch in the cervix is put in at right angles to the others, an everted, eroded cervix may result. There is as a rule no danger of rupture of the lower uterine segment in subsequent delivery.

CESAREAN SECTION

Historical.—The operation probably owes its name to the latin "cedere"—to cut, and not to the reputed birth of Julius Cæsar. It was done for the first time successfully about 1500 A. D. by a Swiss swinegelder, on his own wife. The first deliberate operation was in 1610. As the operation is frequently performed among savage races, it is unquestionably

much older than the dates given above. Prior to Porro (1877) and Sänger (1882) the mortality was so great that it was only done as a last resort.

Indications are of two classes: I. *Absolute*—a pelvis contracted below 7 cm. at the brim or 6.5 cm. transversely at the outlet; (2) absolute obstruction by a tumor in the pelvis; (3) gigantic child; (4) extensive cicatrices or carcinoma of the cervix, vagina or rectum.

II. *Relative*—where a choice of methods exists, but where cesarean section seems to give the best chance for both mother and child. Perhaps the best example of this is a patient with a contracted pelvis with a conjugate of 8 cm., who has had one or two stillborn children by other methods, or a case of placenta prævia.

A breech presentation in a contracted pelvis adds considerably to the difficulty of delivery, and cesarean section will be needed with measurements that would not necessarily require it in a head presentation.

To meet the different indications presented, more than one technic is necessary. At least five different methods, excluding the misnamed vaginal cesarean section, are required. The five are as follows: (1) The old classical cesarean, with the long incision and eventration of the uterus before opening it; (2) the more modern short incision, opening the uterus in situ, and then closing the uterine wound outside the abdomen; (3) one of the many varieties of extraperitoneal cesarean section; (4) the Porro operation, sewing over the uterine cervical stump and dropping it after hysterectomy; (5) the Porro operation, in which the stump is closed, and then marsupialized by fixing extraperitoneally in the lower angle of the abdominal wound and drained. These technics meet the indications presented, in a way impossible if only one method of performing the operation is used. In operations of election, the best time is one week before term.

Preparation of the Patient.—In cases of elective operation, the abdominal skin is as carefully prepared as for any other

section. Most of the cases are emergencies, however, and a satisfactory skin preparation is thoroughly to shave, and then cover the abdominal skin with a thick poultice of tincture of green soap, held on by a binder. This is left on until the patient is on the table, then removed and the skin further cleansed with alcohol and covered with rubber dam, through which latter the skin incision is made. The dam answers the same purpose as the surgeon's gloves.

In all cases, except those who have not recently been examined and who are not in labor, the vagina is cleansed and packed with sterile gauze. This gauze is removed when the operation is completed, otherwise it dams back the blood and may be a cause of postpartum hemorrhage, from retention of clots.

Technic of Cesarean Section

I. The Old Classical Operation.—This is the easiest and hence the best for the occasional or inexperienced operator. It has certain grave disadvantages: (1) The greater likelihood of hernia, in the very long wound; (2) the greater chance of adhesion of the uterine wound to the abdominal; (3) the greater chance of contamination of the peritoneal cavity, especially after the uterus is emptied and while the uterine wound is being closed.

It is one of the methods to be considered in a clean case, but is not a safe method in a case where contamination is suspected, due to repeated examinations or futile attempts at delivery.

Technic.—(1) The patient's skin is prepared as for any abdominal operation and in addition, the vagina is cleansed and packed with sterile gauze.

(2) As soon as the operation is begun, the patient receives, by hypodermic, 2 ampules of aseptic ergot, and 1 ampule (1 mil) of pituitrin, given in that order.

(3) A long incision is made, extending from half-way between the umbilicus and xiphoid to near the symphysis, and the uterus delivered outside the abdominal cavity.

(4) Large gauze pads, with tapes attached, are packed

behind, to either side and in front of the uterus, to safeguard the peritoneal cavity from contamination.

(5) An assistant, with both hands outspread, compresses the abdominal wall around the lower uterine segment. This is not to control hemorrhage, but to prevent blood and liquor amnii entering the peritoneal cavity. To compress the broad ligament to control bleeding is a mistake, as it tends to favor subsequent relaxation.

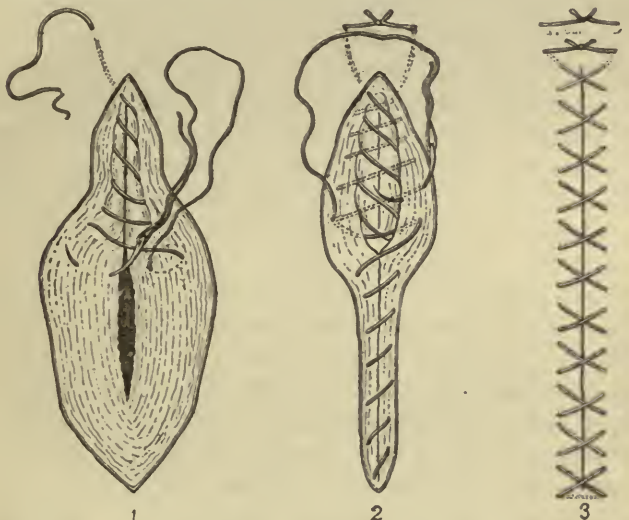


FIG. 216.—The closure of the uterine wound, to illustrate the tier stitch of the uterine muscle and the peritoneal stitch. The material is number 2 catgut of 40-day durability.

(6) The uterus is incised in the middle line, anteriorly. The placenta, if exposed by the incision, is disregarded. The child is seized by one leg and delivered. The cord is clamped in two places and cut, the child being held meanwhile head downward. The child is then handed to an assistant to be revived, if needed, and the cord tied.

(7) The placenta is delivered manually, and the membranes freed by gentle traction.

(8) The first layer of sutures is begun by inserting a curved needle, threaded with a long strand of number 2 chromic catgut, through the uterine wall *above* the wound and emerging in the upper angle of the wound, just above the endometrium. The cut muscle is then closed in two layers, by a continuous tier stitch, care being taken not to penetrate the endometrium. When the upper angle of the wound is reached, in the return, the needle penetrates the wall and emerges above the wound, opposite the point of insertion; the stitch is then tied. Thus no knot is buried in the wound.

(9) The peritoneal covering of the uterus is closed, by a continuous stitch of number 2 chromic catgut, threaded on a straight needle, sewing from above downward, and on returning the needle is inserted between the insertions made on the downward trip. This stitch is also tied *above* the uterine wound, the complete stitch appearing like a laced-up shoe.

(10) The uterus is returned to the abdominal cavity; any clots are sponged out of the peritoneum (usually only a small amount, if any, near the bladder), and the abdominal wound closed and dressed in the ordinary way.

II. The Sänger Operation with the Short High Incision.—This is the best operation for the unquestionably clean case; especially for operations of election. It has the very great advantage of preventing the coincidence of the uterine and abdominal wounds, and therefore minimizing the dangers of adhesions. The short wound is much less likely to be the site of a hernia. It is slightly more difficult than the old classical operation. The only contra-indication to it in a clean case would be a case of placenta prævia, where it is vital to prevent all possible loss of blood during the operation, as here the broad ligament cannot be compressed while the uterus is being opened as in the case of the long incision. Otherwise it is by all odds the best operation for the clean case.

Technic.—(1) The patient's abdomen and vagina are prepared as previously described, and the same dose of ergot and pituitrin is given when the operation is begun.

(2) A short central incision is made, one-third above and two-thirds below the umbilicus, just long enough to permit the delivery of the head.

(3) An assistant compresses the abdominal walls around the uterus, *in situ*, making greater pressure from the patient's right toward her left side. This is to overcome the normal lateral torsion of the uterus, and if it is not done, the uterine incision will be too near the left broad ligament, with considerably more hemorrhage.

(4) The uterus is incised and the child delivered and treated as previously described.

(5) As the head is being delivered, the assistant hooks his forefinger in the upper angle of the uterine wound, and pulls the uterus out of the abdomen, and then packs off with gauze behind and to either side.

(6) The placenta and membranes are then delivered as previously described.

(7) The uterine wound is closed exactly as in the previous operation, the uterus returned to the peritoneal cavity, and all clots sponged out.

(8) The abdominal wound is closed and dressed as usual.

III. The Extraperitoneal Cesarean Section (Laparo-elytrotomy).—It is well known that the chief danger of cesarean section is the risk of peritonitis in the case which has been repeatedly examined and handled, before the operation is undertaken. The attempt to avoid this risk led to many ways of doing the operation extraperitoneally. Some twenty-five different methods have so far been devised. None of them is really extraperitoneal, if by this be meant that it is not possible for contamination of the peritoneum to occur during or after the operation. Most, if not all, however, reduce this danger to a minimum, and this is the most that can be claimed for them.

The ideal indication for the operation is the case which has been in labor for a considerable time, whose lower uterine segment is therefore well thinned out: who has been repeatedly

examined; whose child is in good condition but who is *not* obviously infected; one whose previous aseptic management is open to suspicion, but not one where infection is a practical certainty. It has certain disadvantages: (1) It is the most difficult technically, of all the cesareans; (2) it is not to be attempted before the patient is in labor, as the lower uterine segment is not thinned out; (3) above all, it is *not* the operation for placenta prævia. This is because of the excessive bleeding. These objections apply more or less to all the methods of extraperitoneal cesarean, but particularly to the one whose technic is here described.

Technic.—(1) The patient's abdomen and vaginal canal are prepared as previously described, and the doses of ergot and pituitrin given.

(2) A central incision is made, from two inches below the umbilicus to the symphysis.

(3) The peritoneum of the lower uterine segment is split in the middle line and dissected down behind the bladder.

(4) The parietal and visceral layers of the peritoneum are then clamped or sewed together. The former is quicker, easier and satisfactory. This leaves an oval space of raw uterine muscle exposed.

(5) A broad-bladed retractor is then placed behind the bladder in the lower angle of the wound.

(6) The lower uterine segment is opened in the middle line, and the child's head delivered through the wound, with forceps. During the delivery of the head, the retractor is removed, as its presence increases the risk of a tear of the bladder. A breech presentation makes this step of the operation considerably easier.

(7) The child is treated as in the previous operations.

(8) The placenta is extracted manually, with its membranes.

(9) The wound in the lower uterine segment is then closed with a two-tier continuous stitch of number 2 chromic catgut. This stitch is a little more difficult of insertion than in the pre-

vious operations, but the difficulty is fairly easy to overcome by inserting a single stitch at the upper and lower angles of the wound, and using them as traction sutures, better to expose the incision for the continuous stitch.

(10) The hemostats or stitches holding the two layers of peritoneum together are removed, and the peritoneum of the lower uterine segment sewed back where it belongs, over the uterine wound. Number 2 chromic catgut is used.

(11) The peritoneum is cleansed, and the abdominal wound closed as usual.

Due to the suture line in the lower uterine segment, which prevents it from collapsing as it does after normal labor, the fundus for a few days after labor is held up rather high. This is only for a short time and the rate of involution proceeds normally thereafter. The uterine and abdominal wounds coincide for a small part of their extent only, and adhesions are unlikely. During the whole operation, none of the abdominal organs except the uterus are visible, and the smoothness of the convalescence of these cases will surprise one who sees it for the first time. It is like that of a normal labor case. The field of the operation is limited, but in its field it is a very useful procedure.

IV. **The Porro Operation, with Dropped Stump.**—This is the operation for clean cases complicated by fibroid tumor or other complication making the removal of the uterus desirable, but not in a case where infection is suspected. It is also not a method for sterilization of the patient where such a procedure is justifiable.

Technic.—(1) Up to the point where the uterus would ordinarily be closed, the technic is precisely the same as in the first method described.

(2) The edges of the uterine wound are clamped together and the uterus removed by clamping both broad ligaments, cutting down to the uterine arteries; clamping and cutting them; separating the bladder anteriorly and amputating the uterus below the internal os. All this is precisely the same as the

ordinary supravaginal hysterectomy, complicated by considerably more bleeding.

(3) The cervical stump is tightly closed over the cervical canal, using both interrupted and continuous number 2 chromic catgut, as it is vital to prevent leakage. This step of the operation is done as soon as the uterus is removed.

(4) The broad ligaments and uterine arteries are next tied, and the peritoneum closed over the stump, across the pelvis.

(5) The abdomen is then closed as usual.

This is not a frequently needed operation. Five per cent. of cesareans would be a liberal estimate of the need for it.

V. The Porro Operation with Marsupialization and Extraperitoneal Fixation and Drainage of the Cervical Stump.—This is also an operation of limited field. Its two chief indications are: (1) A case undoubtedly infected before operation, but in whom craniotomy is not to be considered, on account of the child's condition; (2) ruptured uterus.

Technic.—This is precisely the same as in the operation immediately preceding, except that when the stump has been carefully closed, it is brought up in the lower angle of the abdominal wound. The parietal peritoneum of the wound is then sewed around it in such a way as to prevent communication with the general peritoneal cavity. The abdominal wound is then closed, except for the pouch at the lower angle, at the bottom of which is the cervical stump. This pouch is packed with gauze and drained and allowed to close by granulation.

This operation is rarely needed, but when indicated, it greatly increases the patient's chance of recovery.

Sterilization of Patients.—This should never be done, except with written consent of both husband and wife. Verbal consent is not sufficient, as patients have been known to change their minds, and it is well to have the written proof of consent. The dictum of "once a cesarean always a cesarean" is not borne out by facts. Rupture of the uterine scar in subse-

quent pregnancies has occurred in not more than 3 per cent. of cases, and is due usually to poor closure and infection. A clean cesarean wound will safely withstand subsequent labor. When it is desired to sterilize a patient, it is best done by the excision of the tubes at the uterine cornua, the removal of the inner inch of the tube, and the closure of the cornua, burying the stump of the tube between the layers of the broad ligament. Mere ligation of the tubes is not sufficient. All cesarean sections, whose recovery has been uncomplicated, can sit up after the fourteenth day.

Complications During and After Operation. (1) *Hemorrhage.*—The bleeding during the operation is usually no more than after a normal labor. If it seems excessive, it should be remembered that the greatest possible irritation of the uterine muscle is the insertion of the necessary sutures. The suturing should therefore be begun without delay. In emergency, the bleeding can be controlled by compression of the broad ligaments, but this is rarely needed.

Postpartum hemorrhage is not greatly to be feared; the only cases in the series on which these conclusions are based were three in which no hypodermics of ergot were used. In all three of these, the bleeding was controlled by uterine packing. I should not hesitate to pack or irrigate a uterus sewed up as herein described.

(2) *Infection.*—This is the most serious complication, as it nearly always takes the form of peritonitis. The danger can be minimized by careful selection of the type of operation performed, and should peritonitis develop, the Fowler position, stimulation and drainage are the only means of combating it.

(3) *Distention.*—It is not uncommon to see considerable abdominal distention after a cesarean section. Peristalsis is active but the condition requires energetic treatment, not so much on account of any danger, but of the extreme discomfort. Hypodermics of eserin salicylate gr. $\frac{1}{40}$, strychnin sulph. gr. $\frac{1}{30}$ every four hours; hypodermic of $\frac{1}{2}$ ampule of pituitrin twice daily; high enema of alum oz. 1 to the quart; the rectal

tube left in place several hours at a time; and, if there is much gastric tympany, lavage. This routine will correct the trouble within forty-eight hours as a rule.

(4) *Fever.*—Especially in primiparæ, there may be a rise of temperature to 102 or over about the fourth or fifth day, accompanied by some foul odor to the lochia. This is due to a lack of vaginal drainage, and usually not to any retention of clots in the uterus. A daily vaginal douche of sterile water is all that is required. I would not hesitate to irrigate the uterus in these cases, if it should be required, but it is very rarely necessary.

Anesthetic.—Should not be nitrous oxid. Ether or chloroform are preferable. The gas is dangerous to the child. The operation can be done under local anesthesia, but this is undesirable. So little time is needed for the operation, that the short anesthetic period is without risk. It is also very unwise to give morphin in a cesarean section, before the operation. It enormously increases the risk of postpartum hemorrhage.

Child.—It is always advisable to have a trained assistant to conduct the revival of the baby. These babies often show the effects of the anesthetic to the mother and require considerable attention. Particularly is this true when previous attempts at delivery have been made, with extra periods of anesthesia and possible injury to the child. It is common to see these babies born in asphyxia livida, and they require careful handling. The operation by no means guarantees safety for the child, when all these factors are taken into consideration.

Repeated cesarean sections are common. As many as ten have been successfully done on the same patient. This fact must be considered, before the question of sterilization of the patient is decided upon.

Prognosis.—In good hands, the maternal mortality should not exceed 5 per cent., in all cases, favorable and unfavorable. Because of the neglected case, the fetal mortality is considerably higher, though in favorable cases, where no attempt, or at the most, conservative attempts, at previous delivery have

been made, should be very small. The author's experience with the different technics described above has been 173 operations with four maternal deaths, or 2.31 per cent.

Postmortem Cesarean Section.—The fetus will live from five to twenty minutes after the death of its mother, living longer if the mother's death comes very suddenly. In prolonged illness, with slow death, the child often dies first. If the child is viable (past the 28th week) the abdomen should be opened at once and no time lost listening for heart sounds. Legally, the consent of the family is not required, but should be obtained if possible. In the dying patient, operation should take place before death, if the child's heart sounds show distress.

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